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Operating Features of Motor Drive in a Bakery

Advantage of Electricity Exemplified in Establishment of Century Biscuit Company—Details of Installation—Central-Station Service Used

THE application of electric motor drive and central-station service to bakeries is generally recognized as having passed the experimental stage. Its adaptability and economy as a power factor in operating modern bakery machinery have been proven in a large number of the up-to-date establishments; and on the score of cleanliness and sanitation the electrified bakery is incomparably preferable to the plant that utilizes steam drive by means of line-shafts and belting. Then, the superiority of the electric bake oven, where in a number of cases it has been adopted, has been demonstrated. By means of the perfect heat regulation, possible with the electric oven, the bread is evenly baked, and this results in a better color. In the electric oven absolute cleanliness is attainable, and this is not always possible in the use of a brick oven. In applying electric heat to a bake oven the requisite temperature for baking is reached in 30 to 40 minutes after the current has been turned on. In operating the electrified bakery there is not only the absence of coal dust around the place, but there is economy in help and power.

The high standard of cleanliness required of the modern bakery is made difficult, if not unattainable, with the use of overhead shafts and belts which stir up dust. These are as unsanitary as are the oil lamp and the broom.

Reliability of power for industrial plants, for which central stations have gained high recognition, has in many cases been the deciding factor in adopting their service. This dependability and readiness-to-serve are especially essential in the operation of bakeries in which a break-down or an interruption of power would result in loss of material and loss in business.

One of the advantages of the motor drive for bakeries is the uniform speed that may be given the va-

Fig. 1—Allis-Chalmers 5-Horsepower Motor Driving Dough Breakers.—Century Biscuit Company, Indianapolis.

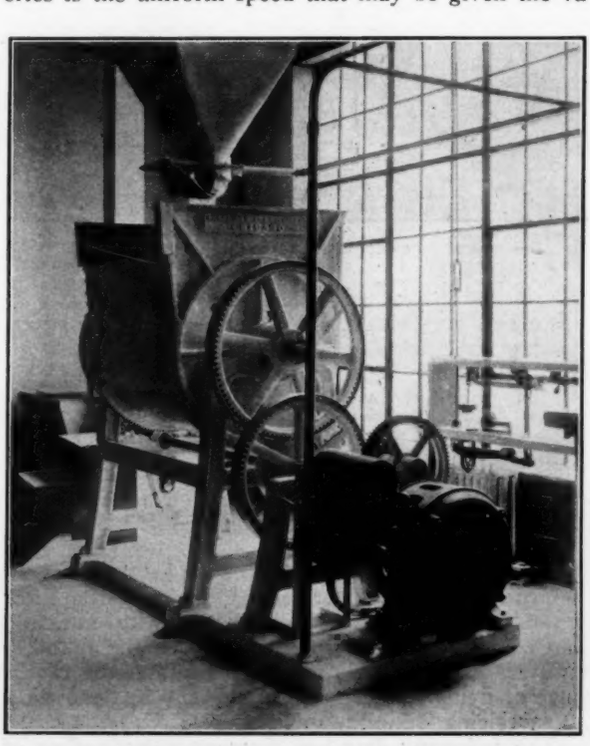


Fig. 2—Modern Dough Mixer, Operated by 10-Horsepower Motor, with Triple-Reduction Gears.

rious machines. As every batch of dough requires the same time and the same process, the importance of speed uniformity is apparent. Then, the adaptability of the electric motor to either individual or group drive for machines is of particular advantage in bakeries, where in some instances a separate drive is preferable for dough mixers. Bakery machinery, as a rule, is required to run at very slow speed, making it necessary to provide for considerable speed reduction between the motor and the machines they drive. Manufacturers of bakery machinery, many of them, furnish machines with motors attached, making of each a complete motor-driven unit, having the necessary gearing for securing the proper speed. However, the group drive has its economic advantages in operating the same class of machines.

In bakeries operated by electricity, the alternating-current motor of the polyphase induction type has been found to meet conditions satisfactorily; and the characteristics of the direct-current motor permit of its use with entire satisfaction, except that in some instances, commutator trouble has been experienced, due to flour and dough forming on the commutator. This can be obviated by using an enclosed motor, although this reduces the motor capacity and requires greater attention in operating. This trouble may be eliminated to a great extent by suspending the motor from the ceiling, or mounting it upon a raised platform, which, however, would make belt connections necessary.

The polyphase induction motor can be used without enclosing, and can be operated satisfactorily even after the windings have become caked over with flour and dough. Where the belt transmission is employed, however, it is advisable to raise the motor out of the range of flying particles, where this can be done without sacrificing flexibility or light.

The following data are given as regards sizes of motors necessary in driving bakery machines. It may be noted that dough mixers require a comparatively high starting torque, and for that reason the motors operating them should have a sufficient overload capacity. Dough-mixing machines range from one to six-barrel capacity:

DAY DOUGH MIXERS.

No. of machines.	Barrels capacity.	Horse-power.
1	1	2
2	2.5	3
3	3	4
4	4	4
5	5	7.5
6	6	10

Sizes given above are for single speed on which the mixer arm of the machine makes 14 revolutions per minute. For very stiff dough the horsepower of the motor should be increased 25 per cent.

Combination machines used in small bakeries, consisting of flour sifter and elevator, dough mixer and cake machine, require a motor of sufficient capacity to drive the dough mixer, this governing horsepower required. Most of such combination machines consist of motor-driven units, however.

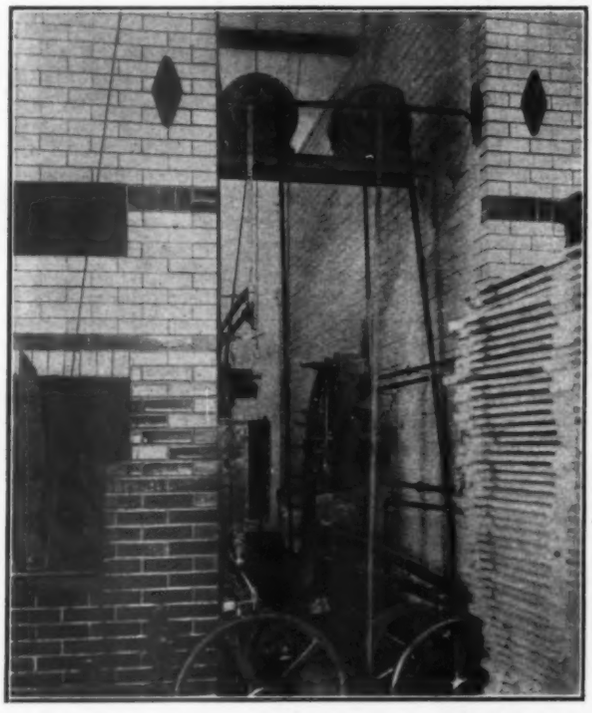


Fig. 3.—Induction Motors, Belt-Connected, to Baking Oven Regulators.

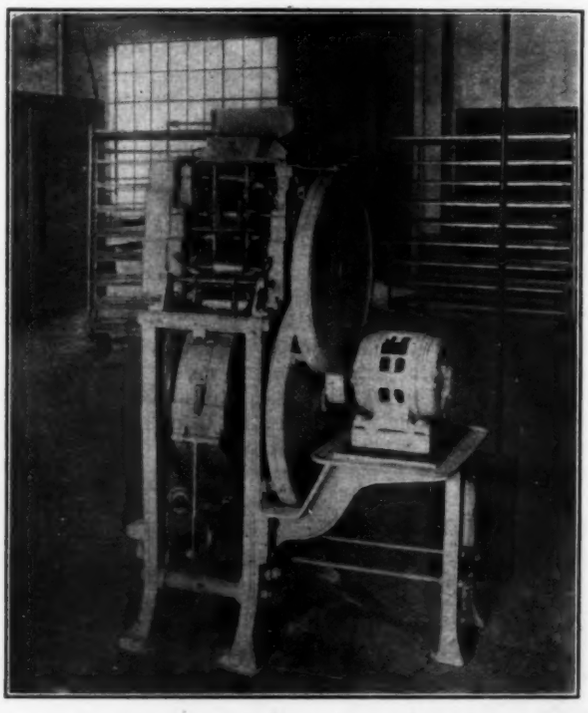


Fig. 4.—One-Horsepower Motor, Direct-Connected to Mixer and Blender.

HORSEPOWER REQUIRED BY MISCELLANEOUS MACHINES.

Machine.	Horse-power.
Moulding machine, 2000 loaves per hour	2
Dividing machine, 2000 loaves per hour	3
Dough breaker	5
Eight-shelf reel oven	5
Meal mill	7.5
Pan elevator	1
Tray elevator	1
Conveyor	1
Flour sifter	1
Ovens	0.5
Blender	2
Packing table	0.5
Read reversible mixer	5

A Typical Modern Bakery.

An excellent example of a modern, electrically equipped baking establishment, for which central-station service is provided, is that of the Century Biscuit

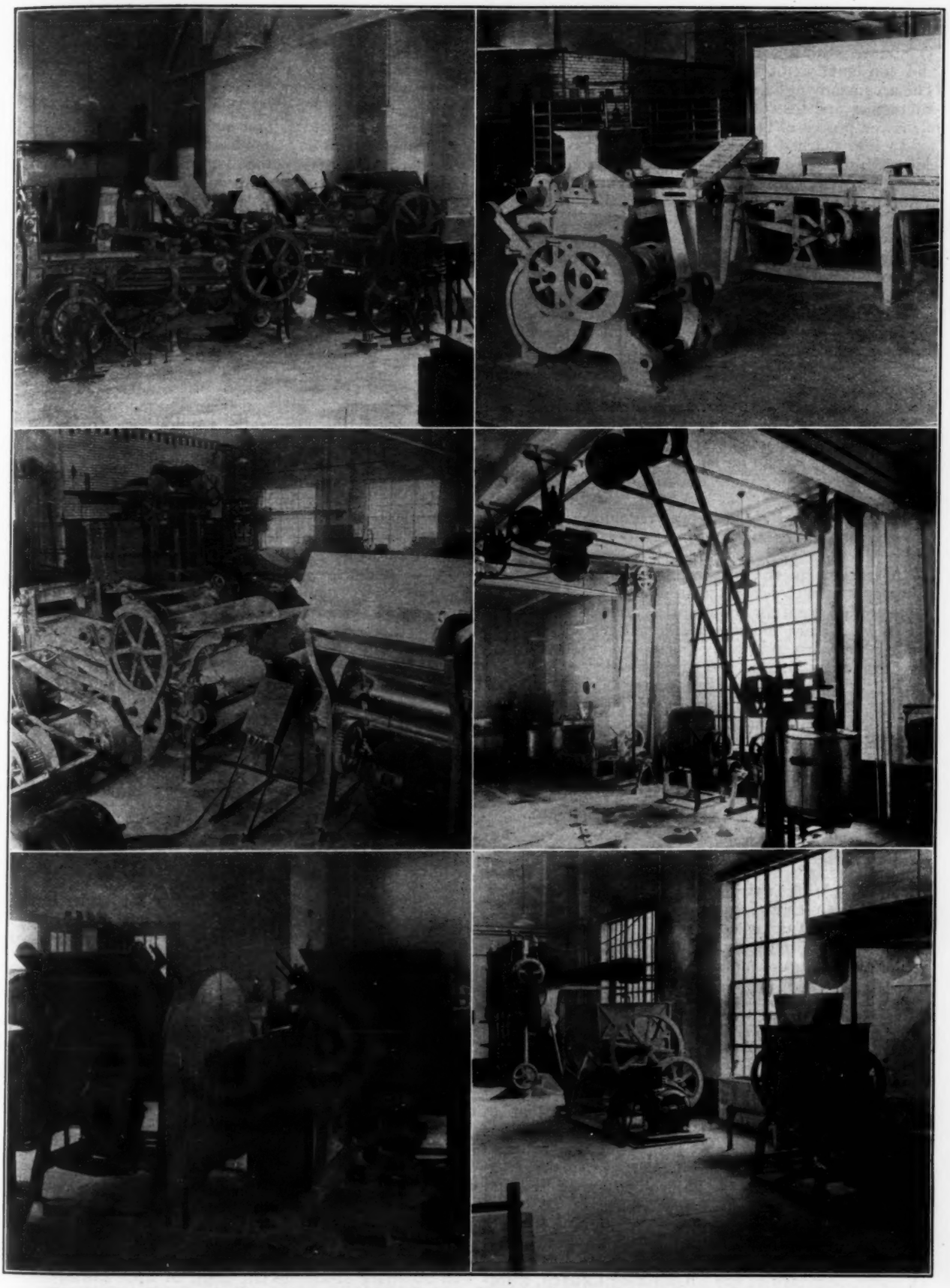


Fig. 5.—Five-Horsepower Motor, Suspended From Ceiling, Operating Cracker Cutter. Fig. 6.—Bread Moulder With Motor Operating as Individual Unit. Fig. 7.—Three Motors Connected to Cracker Cutter, Sheeter and Dough Breaker. Fig. 8.—Chocolate and Other Machines Driven by Five-Horsepower Motor. Fig. 9.—Motors Gear-Connected to Dough Breakers. Fig. 10.—Dough-Mixing Machines Operated by Gear-Connected Motors.—Century Biscuit Company, Indianapolis.

Company, Indianapolis. This plant, which is on the lines of Indianapolis Light & Heat Company, contains 37 motors, with a connected load of 187 horsepower, and consumption of 6200 kilowatt-hours per month. The accompanying illustrations of that bakery make an interesting and instructive picture story of the equipment and processes in this industrial establishment.

In Fig. 1 are shown dough breakers driven by an Allis-Chalmers 5-horsepower induction motor, three-phase, 60 cycle, operating at 220 volts, and 1150 revolutions per minute. The suspension of the motor from the ceiling, and the arrangement of transmission equipment will be noted.

Fig. 2 presents a view of a modern dough mixer operated by a 10-horsepower motor, connected by triple-reduction gears. In this installation the motor is a 220-volt machine, running at 860 revolutions.

In Fig. 3 are shown two induction motors, each of two horsepower, 220 volts, speed of 860 revolutions, belt-connected to oven equipment. In this installation floor space is economized by mounting the motors on steel supports between the ovens, near the ceiling.

Fig. 4 shows a mixer and blender, direct-connected to which is a one-horsepower motor, the machine and motor consisting of an individual unit. In this, as in all other installations of the plant, the motor is the Allis-Chalmers induction type, 220 volts, three phase, 60 cycles. The motor speed is 1130 revolutions, the concealed gears of the machine indicating the reductions of speed.

A cracker cutter and sheeting machine, driven by 5-horsepower motor, are shown in Fig. 5. The motor is suspended from the ceiling below, and is not visible.

In Fig. 6 are illustrated a bread molder, divider and rounder, driven by a one-horsepower, 220-volt motor, forming an integral part of the molder.

Fig. 7 shows a cracker cutter, sheeter, dough breaker and other machines. In this installation, three motors are shown, one of which is gear-connected to the machine it drives.

Fig. 8 gives an illustration of a 5-horsepower motor, driving a line shaft, from which marsh-mallow, chocolate and icing machines are operated by belt transmission.

Fig. 9 shows two 5-horsepower motors, each gear-connected to a dough breaker. These motors operate at 220 volts, speed of 1150 revolutions. The triple-reduction gearing is visible.

In Fig. 10, three interesting installations are illustrated, in which three motors are shown connected to dough-mixing machinery. These comprise a 5, 7½ and 10-horsepower motor, connected to machines through reduction gears.

ENGINEERING COUNCIL TO COMPILE CALENDAR.

A calendar of convention and other important meetings of engineering and relating societies is being compiled by the Engineering Council, located at 29 West Thirty-ninth Street, New York, N. Y. This is being done with the purpose of collecting this information in one place so that inquiries from societies, individuals or publications can be promptly answered and unnecessary conflicts in dates avoided. To assist in making the calendar complete and keeping it up to date, secretaries of engineering, public health and scientific organizations are requested to send to Alfred D. Flinn, secretary of the Engineering Council, information concerning the dates and places of proposed conventions, annual meetings or other meetings of special importance.

LECTURES ON LIGHTING TO STATE FACTORY INSPECTORS.

Through the co-operation of the Department of Electrical Engineering, University of Pennsylvania, and the Departments of Labor of Pennsylvania and New Jersey, a two-day joint meeting of the factory inspectors of these two states has been arranged at Philadelphia to listen to talks and lectures on factory lighting. The first meeting was held on April 25 at the University of Pennsylvania, addresses being made by Dr. E. F. Smith, provost of the University; Dr. Harold Pender, professor of electrical engineering; Acting Commissioner L. R. Palmer, of the Pennsylvania Department of Labor and Industry; Commissioner L. T. Bryant, New Jersey Department of Labor; G. H. Stickney, president of the Illuminating Engineering Society. After luncheon Prof. C. E. Clewell gave an illustrated lecture on "Specification of the Quantity of Light." The importance of this matter to factory-lighting legislation was shown and other factors discussed that seriously affect the problem, such as physiological considerations, allowance for worst conditions, excessive variations of daylight, practical measurement of quantity of illumination.

The second meeting will be held on May 9, opening remarks to be made by W. J. Serrill, past president of the Illuminating Engineering Society. Professor Clewell will give two lectures. The morning lecture will be on "The Relations of Glare to Factory Lighting," this dealing with both general and local lighting, intermediate systems and glare, how to reduce glare, and use of shades and reflectors. The afternoon lecture will be on "The Distribution of Light in Factory Spaces" and will discuss the various degrees of uniformity, evils of lack of uniformity, relation of classes of work to uniformity, use of foot-candle meter to determine degree of uniformity.

These lectures by Professor Clewell, who is doubtless the best known authority on factory lighting, are the first attempts to educate factory inspectors on this subject, the enforcement of the regulation of which is among their duties.

NEW HYDROELECTRIC STATION FOR PENINSULAR POWER COMPANY.

The Peninsular Power Company has under construction a hydroelectric power plant on Brule River, in the vicinity of Florence, Wis., to be completed by next fall. This is to be supplementary to the company's five-unit, 6000-kilowatt hydroelectric plant on Menominee River, near Iron Mountain. The new power station consists of two units of 1666 kilowatts each, with floor space and other provisions for a third unit. The plant is being equipped with two Westinghouse vertical generators and Leffel direct-connected waterwheels. This will give the company a generating capacity of about 9350 kilowatts at its two hydroelectric plants; the new plant's transmission lines will be tied in with the general system.

The new station was designed by and is being built under the engineering supervision of Daniel W. Mead and Charles V. Seastone, Madison, Wis., and the construction and installation are being put through by J. R. McDonald, Black River Falls, whose remuneration is cost, plus a specified net profit. The company has an auxiliary steam-electric plant of 4000 horsepower on Iron River.

Much power is required in that section for mining operations.

Development of Foreign Trade in Manufactured Products

American Business Men Must Prepare Now for World Competition After the War—Address Before Manufacturers

By E. M. HERR

President, Westinghouse Electric & Manufacturing Company.

WE ARE facing as serious and critical a situation in our foreign trade, especially our foreign trade in manufactured products, as the Nation faced at the sinking of the Lusitania, and are doing almost as little toward real preparation for the proper development of this trade as did we as a Nation at that time in preparation for the terrible war in which we are now engaged.

E. M. Herr.

There are many reasons why the beginning of our preparation for war was delayed until its actual declaration but none of these reasons—be they good or bad—apply as a justification for delay in preparation for our participation in the world's foreign trade after the war.

To retain and develop the position we now hold in the commercial and financial world—a position forced upon us by the requirements of the belligerents and not by our own plans or exertions—is one of our greatest problems.

Other countries regard their foreign trade as absolutely essential to their future progress and consequently, notwithstanding the ravages of the greatest war of history and the invasion of their most productive territory—as is the case with France—they are dilligently and steadily working and planning for the development of their foreign trade.

All of the European countries have had their facilities for pursuing foreign trade developed and perfected by years of experience in this the most important and vital part of their commercial world. With us the care and development of our domestic trade, until now so engrossing, has prevented the great majority of our manufacturers from making a serious and continuous effort to cultivate the more difficult field of foreign trade.

Whether we like it or not, we must now face the duties and responsibilities of a world power and take our place as such among the great commercial nations of the earth. Fortunately, the requirements of the war are forcing us to build and equip a Merchant Marine which in all probability will be entirely adequate for our oversea trade at the close of the war.

We also have in splendid effective operation the Federal Reserve System of banks, so successfully handling the colossal banking operations which the financing of this war requires. These banking facilities and the credit system resting upon them adequately take care of the domestic financial situation but we still need a similarly adequate and comprehensive system for handling the financial operations abroad which our development of foreign trade will require—that is to say, such a financial system at home and such banking facilities abroad as will enable the American dollar to be maintained substantially at par throughout the world.

A financial system such as this would of course furnish American commerce with stable exchange and credit facilities throughout the world. A bill to accomplish the stability of foreign exchange, the merits of which I will not attempt to discuss, has recently been introduced in the Senate of the United States by Senator Owen of Oklahoma.

Legislation of this kind is of great importance to manufacturers and the American Manufacturers' Export Association should at once begin to consider how plans can best be laid to work out, through existing commercial organizations and governmental agencies, the most effective treatment possible of this, not only the most important, but I believe, vital development.

A step in the direction of helpful legislation of great importance to exporters is the passage of the long-delayed Webb bill, which permits co-operation and organization in foreign trade to be effective and removes what would have been a serious handicap to our manufacturers in their efforts to meet the remarkably far-reaching plans of our competitors in foreign fields.

With an adequate merchant marine, financial and credit resources and satisfactory legislation, what further is needed to enable our merchants and manufacturers to successfully develop our foreign trade after the war?

Let us first consider what competition we will find

most difficult. Some light on this important subject may come from an examination of the competition met before the war. Then England and Germany were the leading nations in export trade, the United States being third. In 1913 the combined imports and exports of these countries in dollars were:

England $7,000,000,000
Germany 5,000,000,000
United States upwards of.... 4,000,000,000

France and The Netherlands $3,000,000,000 each, followed by Belgium, Russia, Austria-Hungary and Italy with $1,700,000,000—$1,500,000,000, $1,300,000,000 and $1,200,000,000, respectively.

Imports exceeded exports in all the above countries except the United States and Russia. For Great Britain the balance of trade against her was $650,000,000; for Germany $160,000,000, and for France $315,000,000. This difference is paid for by Great Britain through ocean freights, income from foreign investments and the trade in manufactured commodities among the countries. The other countries pay for their surplus imports in general in the same way, a larger amount, however, being paid in trade, which means that they are all vitally concerned in their foreign trade and are, therefore, the great trading nations of the world, and the largest and best customers of the United States. We, however, take from them more of their manufactured products—they from us more of our raw products. As we develop in ability to reduce the cost of our manufactured products and learn how to better meet the exact requirements of their trade, we will gradually increase our exports of manufactured products to these countries. This is especially true now that we have become a creditor instead of a debtor nation.

The opportunity for such increase is, however, much better in those countries of smaller industrial development, like Russia, Japan, China and the South and Central American countries, all largely dependent on imports from foreign countries to supply their need for manufactured goods.

All trade is reciprocal and we must not forget that if we are to supply a nation with the products of our industry, we must take from them a considerable proportion of this trade in their products or establish some trade or financial relation which will enable them to largely pay us in trade for our goods. It requires co-operation among our manufacturing exporters to bring about the best results in this as in other trade matters.

The favorable balance of trade which this country has enjoyed since the outbreak of the war, amounting in the past two years to upwards of six billion dollars, has resulted in a gold reserve in the United States far exceeding all records. This gold after the war will be a shining mark for the trade organizations of foreign governments. A portion of it will undoubtedly go abroad, notwithstanding any efforts we may make to keep it, but a violent reversal of the flow of gold would rudely and disastrously disturb the great structure of bank credits reared upon it and with the stability of which we as manufacturers are so directly and vitally concerned.

How can this situation be safeguarded? The primary safeguard must be a stimulation of exports of merchandise required in times of peace to take the place of the abnormal demand for munitions of war. It will not only require the utmost effort on our part in organization and co-operation in industry and the support of our Government, but also the greatest development of efficient production we have ever attained.

In order to appreciate what we should do to meet the situation, a knowledge of similar activity in other countries will be helpful. In Great Britain the problem of rehabilitating her position in foreign trade has been approached with an enthusiasm and thoroughness in which there is both suggestion and inspiration for us. In addition to the tremendous activity incident to carrying on this great war, there has been appointed a Ministry of Reconstruction. This body, together with other government agencies, is arranging and carrying out a most comprehensive program for redirecting a nation's energy, and refitting men and industries now engaged in war work along such lines as will insure the utmost development of every resource of the nation. Production and economy are to be the keynotes. By the first wealth is created; by the second a surplus acquired which will be used to extinguish the national debt. In preparation for this intensive development of her resources, Great Britain is taking, under the direction of the Ministry of Reconstruction, the Ministry of Munitions, the Board of Trade and other governmental agencies, a complete inventory of the agricultural, mining, industrial and commercial resources of the nation. Nearly one hundred committees are now busy on this great work. A new department created jointly by the Foreign Office and the Board of Trade and known as the Department of Overseas Trade (Development and Intelligence) is also at work. By this means a single body is to control and co-ordinate the sources of information in regard to buyer and seller. Better trained men are to be sent out to every corner of the world to stimulate and develop British export trade. In many other ways and by unusual and remarkably effective methods not only Great Britain but France and Italy as well are already hard at work on the upbuilding of their foreign trade after the war. No one doubts that Germany is doing as much or more, so that if the United States is to take her place in the world's trade after peace is restored, immediate action on constructive lines is necessary. Much of this work lies beyond the scope of the American Manufacturers' Export Association, but a great deal can be and should be done through this association and its members.

Investment by our people in the business and resources of a foreign country will powerfully aid in our ability to cultivate and hold them as customers for our products.

With our comparatively high wage scale, it is of the greatest importance that every possible effort be made to increase production. Every labor-saving device possible must be used and where practicable others developed and our workmen encouraged and urged in every legitimate way to make their production as large as possible, consistent with the highest quality.

It is not alone the workman, however, who is responsible for the amount of production secured. Much depends upon the management and the skill with which the materials are handled and the workman kept supplied with materials, tools and facilities and trained to use his tools with skill and consideration for their maintenance. We in the United States having long excelled any other nation in the design and construction of our machine tools, should now pay especial attention to the quality of our product for it is easier to produce very high grade product efficient with our excellent tools and more broadly intelligent workmen than can our competitors with less efficient workmen and tools.

Let us, therefore, arise to our opportunities and by our own efforts and energy make effective the wonderfully improved facilities for foreign trade now at our disposal.

TRACTOR SAVES TOWN FROM DARKNESS

Used to Drive Generator at Wilson, Kans., When Engine Fails—Made a Permanent Installation.

By Joseph H. Wiley.

In western Kansas lies a little town named Wilson. It is a very small town, so far as population is concerned, but as to brains and ingenuity, the townsfolk of this little western village are second to none. The people had supplied, through their municipal government, a power plant to furnish them with electric light. Two gas-engine-driven generators furnished the power for the light, and although they were a little hard on the contents of the town coffer, they seemed to give satisfactory service and an unvarying quality of power. But surroundings, you know, have a great deal to do with making or breaking a character, and in this particular case which we are about to relate it was a break.

One day the engines driving the generators failed, shutting down the entire plant. It was certainly a precarious situation and an exasperating predicament. The village fathers were in a quandary as to what direction to look for succor. Hope for remedy seemed useless. They would have to send to the company for a new engine, which would take weeks to get and put in position for their everyday work.

Hope is never lost while there is life and a spirit of co-operation. A permanent asset cropped up from an entirely unexpected quarter. Hearing from some worthy news gatherer that the town was practically in total darkness, due to the disabling of the big motor from some unknown cause, a prominent farmer living on the outskirts of the village became interested. He owed much of his prosperity and home comforts to the little village, and as a real American, he was willing to admit it. He went further than that—he determined to show his municipal patriotism by coming to the aid of the community and alleviating their discomfort. This farmer was an intelligent man and knew every utility which he owned. One of these implements was a 40-80-horsepower Avery tractor. He went straight to the village fathers and stated briefly that he could present a successful solution to the difficulty weeks before they could expect to by sending back to the company for another large engine. They say a drowning man will grab at anything, even if it be but a straw, and the Wilson authorities grabbed with such vengeance that our farmer friend no doubt was somewhat taken aback.

The next morning, bright and early, the farmer was on hand at the power plant to corroborate his statement. He also had with him his trusty tractor. The engineers were also on hand, having been notified by the authorities that there was going to be "something doing."

The two forces worked in collaboration and succeeded in harnessing the big tractor to the generator. The farmer turned over his tractor and it did the work.

All this happened some 20 months or so ago, and Wilson authorities have not yet sent for a new motor of the former type. The trouble which caused so much discomfiture and confusion is not yet remedied. In fact, the Wilson authorities decided after seeing the tractor in action that an investment in one of the old type motors would be nothing short of foolhardiness.

There came a time when the farmer was in need of his tractor for some autumn plowing. He accordingly notified the village authorities to release the tractor as soon as possible, as his need for it was

Tractor Used for Driving Generator When Engine Failed.

growing stronger every day. The Wilson authorities were loath to do so, but after much discussion, they finally decided that a new 40-80 tractor motor would be a worth-while investment. They wrote to Avery Company, asking them to ship a tractor motor of this type at once, as the need for same was urgent. The company replied in the negative, stating that they did not have enough motors to supply the demand for tractors and were very sorry but could not supply the Wilson needs, however great the urgency.

Here's where diplomacy came in. The farmer was instructed to order a 40-80 tractor motor of Avery Company. The company had him on their books as a regular customer and it behooved them to look after his wants in the tractor line. A new engine was dispatched to Wilson and turned over to the Wilson power plant.

The company's embargo was frustrated, but it proved an ultimately satisfactory frustration for both parties. This new engine was put in place July 14, 1916. It is attached to the floor of the power house by means of a special steel-bridge construction and is so constructed that there is absolutely no vibration of the motor. A very poor grade of distillate is used which averages from 36 to 38 degrees gravity. The motor is forced to pull a 50-kilowatt alternating-current generator with a 25 per cent overload. The 40-80 horsepower tractor motor is on duty 23 hours per day. During this length of time it consumes about 1.5 gallons of lubricating oil and 70 gallons of fuel. The only time that this motor is allowed to rest from its arduous labors is between the hours of 5 and 6 in the evening, when it is given a thoroughly systematic overhauling and then started up again to run another 23 hours. It has not been necessary to change in any way the connecting rod bearings yet. This engine in 20 months has accomplished approximately 14,500 hours of the hardest kind of labor and has accepted its lot as a steady diet without an untoward act of any kind.

The chief engineer at Wilson said, in speaking of the change to a company representative, that the two motors, which previously ran the power plant, cost the town of Wilson about $7000 several years ago. This included the initial outlay only. He also stated that to buy one of the large engines now under present war conditions would mean a disbursement of from $4000 to $5000.

The engines now in use at Wilson are one large engine and one tractor engine. The engineer also stated that the larger engine is costing about 50 per cent more than the tractor for expenses. The large engine is a 16 by 77 twin; the fuel used on both engines is a very low grade distillate, costing on the average about 5.5 cents a gallon.

The tractor engine is kept cool by running the water outside the power house over some screens and then pumped back into the building and used in the engine again. About twice a day it is necessary to look to the oil supply, which is replenished about that often, but sometimes the engine can be run with a change of oil only twice in a day and a half.

Permanent Installation of Tractor Engine in Plant at Wilson, Kans.

Relation of Load-Factor to Operating Cost of Electric Drive

Importance of Maximum Demand and Load-Factor on Charges for Electric Power—How Excessive Loads in Different Types of Motor Drive Can Be Reduced

By D. R. SHEARER

THE charges for electrical power are usually based on several factors which are so synthetized as to make a fair and equitable rate to the consumer and produce a reasonable return on the investment to the central station. Most of these factors may be altered within certain limits by any consumer and thereby greater efficiency and economy may be secured without decreasing the amount of manufacturing work actually done. It is the relation of these factors and the possible changes in each that the plant owner should be conversant with in order to secure most satisfactory results and most efficient operation.

The consumer in general is prone to think of 50 horsepower as being merely that amount of power, no more and no less, and with no possibility of change so long as that much power is required to drive his machinery. This belief is, to some extent, untrue and so appears when we consider the methods of arriving at the power rate based on the factors usually employed in calculating the charges for power against any consumer.

At first glance it would appear that the central station should charge merely for the amount of power or electricity used, just as the grocer would charge so much for each pound of flour purchased. But this would not be equitable as can be seen by carefully considering the operation of any central station, for the station must install machinery, equipment, lines and transformers to care for the maximum peak loads at any time during the day and night and stand in readiness to serve any consumer according to his individual requirements regardless of the average power demand of that individual.

Factors on Which Rates Depend.

Thus the rates are ordinarily based on the following factors or a greater part of them:

(1) The maximum demand for a specified period of time, usually from one to ten minutes, or even longer. This refers to the greatest period peak of the consumer's plant load.

(2) The time of day or night at which these peaks are to be expected and prepared for by the central station. Obviously, if the peak loads of all consumers came at the same time of day, a much larger generating capacity would be needed than could be used with advantage during the remainder of the time.

(3) The time duration and time in the 24 hours in which the regular or normal load occurs and the class of service desired, whether regular or intermittent.

(4) The actual amount of electricity consumed during a definite or stated period of time, usually one month.

(5) In some instances the power-factor of the load, if alternating current is used. It is sometimes desirable to make a charge for this factor because the lower the power-factor of a load the larger the wires and generating equipment needed regardless of the real power used and further because most wattmeters are corrected for power-factor and therefore do not register all the current passing but only the working current.

All these factors are susceptible of mechanical record by means of recording or graphic instruments, but usually only the first and fourth are so recorded continuously—the first by means of a maximum-demand indicator and the fourth by means of an integrating wattmeter. The other factors when entering into a rate are often made a part of the contract when the plant rate is established, for they are dependent mainly upon the kind of plant and its methods of operation and are not therefore easily changed in any given installation. Sometimes a rate is made only after a plant has been put into operation and careful tests made of all operating conditions over a period of some weeks or months. For the present, however, let us consider chiefly the maximum demand and its relations to the other factors together with any changes that may be made leading to more economical operation.

As previously mentioned, the maximum demand is the greatest load occurring over a short period of time and this load is usually subject to a direct charge per kilowatt, this charge forming the basis of the rate charged. Therefore it is evident that the maximum demand should be kept as near the actual running load as possible. In other words, if a given plant requires 100 kilowatts for continuous normal operation, it means economy to keep the maximum demand near this figure and not allow the machinery to demand, say, 200 kilowatts now and then for periods of time long enough to allow the maximum-demand indicator to register this peak, for the demand charge would then be based on the 200 kilowatts. These demand indicators are set for certain periods of time, one, five or ten minutes and in special cases even longer, depending on conditions. As a general principle, other things being equal, the longer the time for which the instrument is set the less will be the demand charge on a given installation. For instance, a 200-kilowatt peak for one minute would not register very much, on an indicator set for five minutes and even less on one set for ten, above the 100-kilowatt mark if this were the normal load, but if this peak continued for the indicated time the peak would be recorded against the consumer, and become the basis for his demand charge during that month.

The relation between the average power required, say for a month, and the maximum demand during the same time is called the load-factor and is expressed as a percentage. The nearer this ratio is to one, or the percentage to 100, the more economical the operation, for the consumer is not then charged for excess de-

mand over that which he actually uses. This load-factor varies with different types of manufacturing enterprises and ranges, as an example, from 22 per cent for a saw mill to 80 per cent and higher for some types of cotton-spinning mills, but it can be increased in practically any plant by a judicious installation and arrangement of motors. How to secure such an installation in the most economical and direct manner is the question to be considered.

Economies of Different Methods of Drive.

If we consider a plant driven entirely from one motor by means of line shafting and belting, we are somewhat restricted as to the possible changes leading to a gain in efficiency and can only raise the load-factor by two methods: By securing a motor that takes a smaller starting current and by keeping the machine as nearly fully loaded during operation as the equipment will permit. Differing types of motors require more or less current to bring them and the mechanism to which they are attached up to operating speed, but always more than the full-load rating. In the case of a squirrel-cage alternating-current motor the demand for a short time is from 2 to 4 times normal in starting, while a wound-rotor motor may be brought to speed with from 1½ to 2 times running load demand; therefore it is essential that the proper size and type of motor for a given work be secured at the start.

This is even more important in those plants where the demand is figured as a percentage of the connected load and not from a demand indicator. When the demand is calculated in this manner the nominal sizes of the motors are added and an assumed percentage of this figure is called the maximum demand. Thus an over-motored shop will have to pay a larger demand charge than if all motors were of the proper size.

As to keeping any motor fully loaded, assuming that it is of correct size, this can only be done by an efficient handling of the men and materials in the manufacturing operation. If any one machine is subject to severe peaks, it should be arranged that some other machine should be underloaded at the same time, thus averaging the demand and avoiding a high maximum. That is, concurrent machine peak loads should be obviated if possible.

It is to be noted that in the case of a single driving motor the line shaft and belting losses run up considerably, sometimes as high as 40 to 60 per cent of the normal power demand. Of course, there is always a possible saving at this point by means of better belting, roller bearings, well lined equipment and proper speeds but this is a mechanical question and can be considered as not applying to the points under discussion.

The next method of drive to be considered is where power is supplied to the machinery by means of several motors, each driving a group of machines or, as it is called, the group drive. Here the friction losses are less than with the single drive for much of the shafting and belting is done away with. In this system, which, by the way, is the one most generally used, the diversity-factor plays an important part in the economy of operation. Technically speaking, the diversity-factor is the ratio of the sum of the maximum demands of the several motors used to the maximum demand of the entire system and this also can be expressed as a percentage. This factor is an outcome of the law of averages, since all machines are not fully loaded all the time, the peak load of one coming during the valley load of another on the same system and so producing a smoother load curve for the whole operating plant. Another advantage of the group drive is that one or more entire groups can be shut down in order to keep the remaining ones fully loaded should occasion demand. This cuts out entirely the friction load on that group. For instance, assume the friction load to be 20 per cent on any one group when fully loaded; then if the group is half loaded the friction loss becomes 40 per cent of the power used. Moreover, the motors operate less efficiently at half load.

The third method of drive is individual, in which case each machine is driven by its own motor. Here the diversity-factor is given the greatest chance to show a saving and it is also possible to build the load-factor up to the highest point attainable. The maximum demand, too, may be kept near unity, because the starting and load peak of any one motor has a relatively small influence on the total power demand. Shafting and belting losses are still further reduced and practically all the friction losses are those inherent to the machine being used. By proper handling, the load-factor can be improved from time to time, especially relative to the motors actually in use at any time, for lightly loaded motors can be shut down and others made to handle more work or they can be stopped until material accumulates sufficiently to secure a load. Practically any type of motor is more efficient at full-load rating, so a secondary saving in actual current consumed is effected by individual drive and this should be considered carefully when the initial installation is designed.

Apparently, the third method of drive shows the greatest efficiency but there are other factors entering into the true result. For instance, the voltage drop in the electric wiring, distribution and control equipment and in some cases the necessity of installing a much larger motor than necessary for the average load on account of the violent peaks on particular types of machines, thus normally working the motor considerably underloaded. In cases of the latter type group drive is often more economical so that the motor may have excess power available for the peaks on a particular machine and yet may be kept normally loaded.

As an example, assume a machine to require 25 horsepower for operation but subject to peaks of 50 horsepower. If one individual motor were installed, we would be forced to use one of 35 horsepower so that with the allowable overload capacity of 50 per cent we could operate the machine during peaks. By doing this, however, we would be working the motor 10 horsepower below rating nearly all of the time. If we make a group drive and include this particular machine with others not subject to such peaks or of a smaller size and thus make up a set of machines requiring 50 horsepower for normal operation, we can install one 50-horsepower motor that will meet all the conditions effectively. This motor will develop 75 horsepower, using the 50 per cent overload capacity, and will therefore furnish the extra 25 horsepower to care for the machine peak even when the remaining machines are fully loaded and still allow us to work the motor up to its normal rating continuously. This method would mean a still greater saving, if the maximum demand is calculated as a percentage of the connected load.

Questions to Be Considered.

By applying the following catechism to any manufacturing enterprise we are able to determine whether the efficiency is up to the highest mark possible:

1. Is the plant subject to unnecessary peaks which may run up the maximum-demand charge and can this be prevented by rearrangement?

2. Are all the motors working near full-load capacity, and can those not so loaded be shut down without interference to the remainder of the plant equipment?

3. Is the line shaft, belting and other friction load too large and can it be reduced by a different drive or changed grouping?

4. Is the plant as a whole over or under-motored?

5. Is the wiring, control and other electrical equipment of sufficient size to prevent excessive losses in voltage between the service and the motors?

6. Is each motor the best possible size and type for the duty required of it?

7. Will a different grouping of machines allow a reduction in the size of some motors?

If these questions are applied to a particular plant in practically every case it will be found that changes can be made which will greatly improve efficiency, both by increasing production and by reducing current or power bills. Usually the services of an engineer will be desirable when making this final analysis of the installation and many tests may be required before sufficient data are at hand, but the step is usually justified for it is surprising how much loss may be avoided by a little attention and thought to the questions of load-factor and proper arrangement of motors.

Example of Economy from Rearrangement of Motor Drive.

As a concrete example of what may be done, the writer was called upon to make tests and recommendations leading to the more economical operation of a furniture-manufacturing plant with the following results:

The plant was arranged for group drive with 30 per cent friction load, 10 per cent of which was preventable; several motors were greatly overloaded, causing violent starting and operating peaks; other motors were only one fourth loaded; the losses caused by the wiring being too small amounted to 20 per cent. Although this was an exceptionally bad case, rearrangement and change in the wiring system brought the following results in reducing the cost of operation.

Percentages saved:

Friction, 10 per cent;

Maximum demand, 15 per cent;

Efficiency of motors, 2 per cent;

Wiring distribution, 16 per cent.

The total saving was about $1500 per year, while the cost of the changes was about $900. Thus $600 could be saved the first year and $1500 in succeeding years, leaving aside the charges of interest on the additional investment and the increased output secured by the changes. The amortization or depreciation was, of course, decreased on the electrical equipment, for the motors were now operating under normal load.

Developments in the Internal-Combustion Engine.—C. F. Kettering, president of the Society of Automotive Engineers, gave a very interesting talk on recent developments in the internal-combustion engine before a joint meeting of the Chicago Sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, and the Electrical Section of the Western Society of Engineers, that was held in Chicago on April 23. He explained the cause of carbonization of the cylinders and knocking, showing that changes in the character of the fuel and especially its non-uniformity were chiefly responsible. Starting of the engine hot was recommended. Mr. Kettering dwelt quite a little on airplane engines, particularly the Liberty engine, which has now been developed so it can be produced on a large and economical scale. The engine weighs 820 pounds and develops 425 horsepower, or less than two pounds per horsepower; it is very efficient and the best and most powerful airplane motor ever developed. Airplanes are now being produced on a large and increasing scale, contrary to newspaper reports.

ANNUAL MEETING OF AMERICAN GEAR MANUFACTURERS.

New Officers Elected for Ensuing Year—Uniform Cost Accounting Discussed.

The second annual meeting of the American Gear Manufacturers' Association was held at "The Greenbrier," White Sulphur Springs, W. Va., April 18-20, 1918. At the opening session, F. N. Sheppard, of the United States Chamber of Commerce, spoke on "How We Can Get Behind the Government and Help Win the War"; and B. F. Waterman presented a paper on "Gear Standardization."

The election of officers and an executive committee, at the second day's session, resulted as follows:

President, F. W. Sinram, Cleveland; vice-president, H. E. Eberhardt, Newark; secretary-treasurer, Frank D. Hamlin, Philadelphia.

Executive committee—three years: F. W. Sinram, Cleveland; Frank D. Hamlin, Philadelphia; H. E. Eberhardt, Newark; two years: Frank Burgess, Boston; Geo. L. Markland, Jr., Philadelphia; Milton Rupert, Pittsburgh; one year, Wm. Ganschow, Chicago; E. J. Frost, Jackson, Mich.; H. W. Chopin, Syracuse.

The annual dinner was held on the evening of the 19th, at which addresses were made by John G. Willys and F. N. Sheppard.

At the closing day's session, papers were read by J. H. Dunn on "Uniform Cost Accounting," and by F. G. Hoffman and John Edgar on "Hobbs and Hobbing Machines." About 50 members were in attendance.

GOVERNMENT TO GIVE COURSES IN EMPLOYMENT MANAGEMENT.

Courses in Employment Management are being given under supervision of the Industrial Service Sections of the several government departments, including the Emergency Fleet Corporation, the Ordnance Department, Quartermaster's Department, the Department of Labor, and Navy Department. The first course, given at the University of Rochester, comprising six weeks' intensive training, will be repeated at Boston, New York, and elsewhere.

Hitherto executive control of industries has been exercised by the financial, manufacturing and sales departments. The plan is to add to these a personnel, or a service department, which is to have in hand all activities having to do with the human relation—legislation, safety, education, recreation, hiring and "firing," discipline, wage system, etc.

The purpose is to bring together all these matters under one head, manning each sub-section with specialists, to bring about scientific industrialism as nearly as possible. Manufacturers are desired to take a hand in developing this movement and send students to take the training courses being provided. The Employment Managers' Division, 5207 New Interior Building, Washington, D. C., has in hand the matter of arranging for students from industrial plants to take these courses.

Editorial Comment

Making Electric Drive More Economical

PROGRESS of the war, with its increasing demands on the country's resources, is impressing on our business interests in many lines that making the most of present equipment is a necessary policy of these momentous times. Inability to secure additional machinery and other apparatus, except after very long delays and at high prices, is making managers of central stations and manufacturing plants look about for means to meet demands for increased output with the facilities at hand. In many ways this can be done with profit, not only to the particular interests concerned, but to the country as a whole which is called on more than ever to conserve resources and man power as a patriotic duty.

Thus we find central stations going over their plants to eliminate waste both in generating and distributing energy. Low power-factors are being improved with beneficial effects on the plant capacity. Similarly, by improving load-factors, either through cutting down and spreading out of the peaks or filling the valleys of the load curve, the capacity and output can be materially increased and at very little cost. In the same way, manufacturing plants may very advantageously increase their productive capacity if they can improve their load-factor.

When it comes to energy supply by a central station to a manufacturing plant mutual advantage results from an improvement of the customer's load-factor. Reduction of maximum demand and increased uniformity of the load permits a higher utilization of the capacity of the generating and distributing system, and has quite universally been recognized in schedules of power rates. Consequently, the manufacturer benefits from a reduction in his power bill. This matter has been discussed by power engineers many times, but means for improving the demand-factor and load-factor of power customers have not become so well known.

In this issue we present an article by D. R. Shearer on this problem. He discusses the possibilities of reducing the maximum demand with single-motor, group, and individual-motor drive, with motors of different size and type, with the loading of the motor, and other factors. The special point to be noted in Mr. Shearer's article is that in almost every plant there is opportunity for improving the load conditions by an intelligent rearrangement of the motors to give each machine as nearly full load as practicable during its operation and to reduce excessive starting peaks. The tendency in many shops has been to use motors of much higher rating than is warranted by actual working conditions. In the original plant layout mistakes are quite commonly made, not only in over-motoring, but also in using the wrong type of motor or drive, or improper grouping of machines, or poor wiring, so that many motors operate at greatly below full load, or there is needlessly large friction loss in shafting and belts, or excessive line drop due to inadequate wire capacity.

Such errors represent needless waste of power that is so sorely needed now and result in continual drain on the capacity of the central-station system when the latter is perplexed with efforts to increase its capacity. At the same time the pocketbook of the manufacturer suffers to a certain extent. As a patriotic duty, therefore, manufacturers might well have their power layout looked into by competent engineers. Mr. Shearer cites an instance where $1500 per year was saved by an expenditure of but $900. This is by no means a loss to the power company where the latter is enabled through the changes to add other power load now waiting to be served, which is the prevailing condition on most power systems. In fact, it may even be advisable for power companies themselves in many instances to undertake power surveys in the plants of their customers, frankly recommending decreases in demand for the betterment and extension of the service and the growth of good will.

Keeping "Mothers' Day" in a Practical Way

SUNDAY, May 12, is "Mothers' Day," a day that the people of the land observe in which to pay respect and homage to the mothers of the country. No finer pledge is there of a nation's integrity, no more fitting symbol is there of righteousness than the love and honor and respect in which the name and memory of MOTHER is held. On May 12, throughout the land a carnation will be worn in the buttonhole, symbolic of the love and affection we have for Mothers.

But this is a practical as well as a sentimental old world. Let everyone wear a carnation by all means, a symbol of love and honor and respect. But let those that are able do still more for the Mothers that remain. We can show our love in an intensely practical way as well as symbolically.

It is in the power of many of us to save Mother much work, shorten the hours of toil, lighten the worry and make less unpleasant the things that have to be done, and that only Mother can do. As long as there are homes and families there will be work that only Mother can do. But we can make that work easier. The electric washer, the electric flat iron, vacuum cleaner, and the sewing-machine motor will lighten the work and make less of it to do. The toaster, the cof-

fee percolator, broiler and range conserve strength and increase the comforts of the home. The fan, the hair curler, massage outfit improve the person. There is an electrical gift for every mother, whether in the cottage or the mansion. Give something electrical to Mother this Mother's Day.

Electric shops, central-station show rooms and contractor-dealers' show windows can help, encourage and foster the cause of lightening the work of mothers, and while helping a noble cause help themselves by bringing this matter conspicuously before the public.

The electrical gift is not a seasonal gift but an all-year gift. But there are times such as this when it is more than usually opportune.

Sunday, May 12, is Mothers' Day. An electrical gift is a gift that lives not for a day alone, but that lives for many a day to comfort, encourage, and serve, making each day a better day for Mothers. Give Mother something electrical on May 12.

Putting the Goodwin Plan in Practice

MUCH as has been said and published concerning the Goodwin plan within the last year, the purpose and utility of that plan are far from being fully understood by all electrical contractors and dealers. Not a large majority have attended state and district conventions where the Goodwin plan has been explained; and a considerable number of those convention absentees have not informed themselves by reading.

Before the state and district organizations can become effective, in working out the Goodwin plan in practice, it will be necessary to have much personal work done among those of the industry who are not as yet identified with this organization system. Some are remaining outside because of a misconception of what the Goodwin plan stands for; others are not members because, confessedly, no one has solicited their membership; still others, apparently, prefer to plod along as independent entities and stay out of all organizations. The great majority of non-members may readily affiliate themselves with district and state organizations if some influence and effort are exerted to interest them.

If the man with a grievance is shown that he will have fewer grievances by coming into the organization than by staying out he will not refuse to join.

If the man who doesn't like the competition he has to meet can be made to see that one of the objects aimed at is to substitute co-operation for destructive competition, he will not refuse to join; in fact, he may find on closer contact that his competitors are good fellows to associate with.

Those of the central-station companies, who are identified with the industry as appliance dealers or contractors, can do much in harmonizing all concerned at district centers. In such localities their friendly attitude toward the association means much for its success.

The best organized states are those in which the Goodwin plan is best understood. We may refer to the state of Wisconsin as one of them; and the good understanding of the plan in that state is largely due to the activities of the association's field secretary, who has traveled much over the state explaining the plan and securing members. The large membership in Wisconsin shows what is necessary to build up a state association.

Relieving Traffic Congestion

MUCH has been said recently concerning the congestion at freight terminals and piers and how the solution of the problem lies in the adoption of electric tractors, conveying systems, etc. Of equal importance is the relieving of the acute congestion in our city streets, as it will avail but little if we modernize our terminals and neglect our main arteries of commerce. Night haulage and the substitution of electric vehicles for horse-drawn wagons will do much towards improving conditions, but in many cities, particularly at important street intersections, final relief can only come by the adoption of elevated roadways to handle a portion of the traffic.

Dr. John A. Harriss, special deputy police commissioner for traffic, New York City, has designed such a system to relieve congestion on Fifth Avenue, New York. He suggests an elevated roadway to extend on Sixth Avenue from Fortieth Street to Fifty-ninth Street for through automobile traffic. This would not only create two shopping levels but would keep the street, at ground level, free for trucking and street cars and, it is claimed, solve the transportation problems of that district.

The plan of Dr. Harriss is a commendable one and deserves the hearty support of the electrical industry, not only from the civic standpoint but because of the new fields for the utilization of electrical energy and equipment that will be opened. The plan, if successful in New York, can be adopted elsewhere with equally good results. It has already been successfully used in London, and Chicago is beginning to put it into effect.

Water-Power Legislation Should Not Be Deferred

IT IS to be hoped that this Congress, before adjournment, will not fail to enact a law that will leave no barriers to water-power development designed to produce electrical energy. Considerable time will be required, after such a law is passed, to enlist the capital and organize construction forces necessary to start work on hydroelectric projects, and an equally long period to put them through to completion. While it may be regretted that such vital matters had to be deferred until the stress of war compels attention, the outstanding fact at this time is that this important matter should be settled both for the present and the future requirements of the country.

Week's Events

Wisconsin Electrical Contractors Close Convention—Engineering Council Opposes Appropriation Bills—Other News

OKLAHOMA UTILITY COMPANIES MEET IN ANNUAL CONVENTION.

Wide Range of Subjects Considered—Association Decides to Employ Secretary on Publicity Work.

The Gas, Electric and Street Railway Association of Oklahoma held its seventh annual convention at Oklahoma City, April 22, 23 and 24, at which numerous matters of vital interest to the public utility companies were considered by way of addresses, papers and discussion. In order to properly gather and disseminate facts of interest to companies and persons supplying utility service, the convention decided that the association employ a secretary for such work. The selection of a secretary was placed in the hands of the state executive committee of which John W. Sharlet is chairman. This was probably the most important action taken by the convention. J. F. Owen, manager of the Oklahoma Gas & Electric Company was elected president of the association for the ensuing year.

The opening session, after preliminary proceedings, began with an address by the retiring president, F. D. Shafer, manager Chickasha Gas & Electric Company.

The subject of "Electricity in the Oil and Gas Fields" was treated by T. E. Mohrhardt of Southwest General Electric Company; and C. W. Shannon, director of Oklahoma Geological Survey, spoke on the "Reliability of Oklahoma Oil and Gas Fields."

The second day's session was featured by the following: Electric Railways and the War—Guy B. Treat, chief engineer, Oklahoma Railway Company; Oklahoma Utilities and the War—Prof. L. W. W. Morrow, University of Oklahoma; High-Tension Transmission and Distribution—Lee Boyer, engineer, Choctaw Power & Light Company; Gas-Fired Boilers—L. A. White, superintendent, Muskogee Gas & Electric Company.

Interesting discussion followed the address under each heading. Prof. L. W. Morrow, in discussing increased fares of street railways said:

"If we had a six-cent coin the one-cent increase might be feasible. But the expenses and delays involved in handling the extra penny make it far from desirable. One company in New York city, to find a way out of the difficulty, has coined a so-called six-cent piece, which it accepts for fare, and which has become almost legal tender anywhere in the city."

John W. Shartel thought the adoption of a six-cent fare would hardly solve the problem and that a cut in the service seemed the logical step to meet a situation caused by advancing prices of everything that the railway company uses in operating.

On the closing day the interest centered on the subjects treated in the following addresses:

Needed Utility Legislation—Chas. Hoopes, assistant operating manager, Oklahoma Railway Company; Utility Taxation—Prof. F. F. Blachly, University of Oklahoma; Relations of the Utilities and the Public—A. L. Mitchell, engineer, Corporation Commission; Relations to Customers—W. T. Dibbens, manager, Guthrie Gas Company.

In the course of the discussion the habit, in some quarters, of stealing electric current, gas and water was repeatedly referred to. One speaker said the opinion that stealing from a corporation was not a serious offense had become entirely too popular; and legislative action was asked to provide a specific penalty for offenses of this kind.

Discussion also developed a demand for a state law to license engineers of public utility plants.

ENGINEERING COUNCIL TAKES DECIDED STAND.

Vigorously Opposes Clause in Pending Bill That Would Tend to Reduce Engineering Efficiency.

As previously announced, the Engineering Council, at its New York session, April 18, appointed a special committee on Industrial Affairs: Prof. George F. Swain, chairman, of Massachusetts Institute of Technology and chairman of Boston Transit Commission; E. W. Rice, Jr., president, General Electric Company; Charles T. Main, president, American Society of Mechanical Engineers; Alex. C. Humphreys, president, Stevens Institute of Technology, and Buffalo Gas Company; and Benjamin B. Thayer, president of the Anaconda Copper Mining Company. Owing to the rapidity with which the Army and Naval appropriation bills are being considered by Congress and the fact that these bills contain proposals opposed to well-tried industrial methods for improving efficiency and increasing production in manufacturing plants, the committee without delay drafted a resolution which was adopted at once by special action of Engineering Council. This resolution is as follows:

RESOLUTIONS ADOPTED.

Whereas, the winning of the war imperatively demands highest efficiency and maximum production in every branch of industry; and

Whereas, we are informed that Congress has under consideration in the Naval and Army appropriation bills proposals to prohibit, diminish and condemn the payment to public employes or to employes of private establishments under Government control any cash reward, premium or bonus for superior service; and

Whereas, these methods if applied with due regard to wages, surroundings, health and safety of the employe will increase efficiency and production, help win the war and preserve our institutions; be it, therefore,

Resolved, that in the opinion of Engineering Council, representing American Society of Civil Engineers, American Institute of Mining Engineers, American Society of Mechanical Engineers, and American Institute of Electrical Engineers, together having 33,000 members, it is vital to the winning of the war that no legislation nor other measure should be adopted which may interfere with highest efficiency and maximum

production, but that, on the contrary, every proper means should be taken to increase efficiency and production.

This resolution was telegraphed to the Senate Committee on Naval Affairs and to Charles M. Schwab, as manager of the Emergency Fleet Corporation. It has also been sent to the Senate Committee on Military Affairs and to a number of engineers in the home states of the senators on those two committees with a request to these engineers that they communicate at once with their senators.

The objectionable clause in the appropriation bills is as follows:

"That no part of the appropriations made in this act shall be available for the salary or pay of any officer, manager, superintendent, foreman or other person having charge of the work of any employe of the United States Government while making or causing to be made with a stop-watch or other time-measuring device a time study of any job of any employe between the starting and completion thereof, or of the movements of any such employe while engaged upon such work; nor shall any part of the appropriations made in this act be available to pay any premiums or bonus or cash reward to any employe in addition to his regular wages, except for suggestions resulting in improvements or economy in the operation of any Government plant."

Engineers, especially those engaged in industrial operations, would readily appreciate the serious effect which legislation of this character if passed would have upon private plants engaged largely or exclusively upon war work under the appropriations carried in these bills. It is most important that such measures should not be enacted.

A careful reading of the third preamble of the resolution adopted by Engineering Council will show that the Council and its committee fully realize that the best interests of the workmen must be conserved and its action has no ulterior purpose to the contrary. The earnest desire of Engineering Council is patriotically to promote in every way the largest production and best efficiency of the country's industrial establishments.

Action Taken by Industrial Conference Board.

Upon the subject matter of the resolutions presented on April 18 by F. P. Fish, chairman of the National Industrial Conference Board, the special committee is now concentrating its attention and making a careful investigation. The resolutions adopted by the National Industrial Conference Board, at its regular meeting in New York City, April 18, are given below:

Whereas, it is daily becoming more apparent that the winning of the war demands the highest efficiency in every kind of production; and

Whereas, many causes and circumstances have unfortunately operated to obstruct, diminish and even interrupt necessary war production, and there is much information and experience to justify the belief not only that we are in many instances securing less production per unit of time and person than heretofore, but that the country is continuously confronted with proposals to lessen the hours of production without first determining the wisdom of such action; and

Whereas, it seems that manufacturers are not fully alive to the necessity of not only providing the best and most systematic service instruction to new labor but should constantly be endeavoring by every practical means to improve the efficiency of the older force, the plant and themselves; and

Whereas, it appears that Congress has under consideration in the Naval and Army appropriation bills proposals to prohibit, diminish and condemn the payments to public employes or to employes of private establishments under Government control any cash reward, premium or bonus for superior service and to forbid time studies; and

Whereas, it appears that the members of the great engineering societies of the United States are peculiarly qualified by virtue of their knowledge and experience to express an opinion upon the present efficiency of our production and the most practical means of increasing the productive capacity of both management and men and to call to public attention questionable proposals threatening our efficiency as a nation and therefore our capacity to perform our full duty in this great struggle; therefore, be it

Resolved, that the National Industrial Conference Board respectfully requests the Engineering Societies of the United States to investigate and to publicly express themselves as to whether or not we are losing or gaining in industrial efficiency, and to state what causes, if any, in their opinion are influencing the condition, and in what manner broadly they believe our industrial efficiency can be further stimulated.

ELECTRICAL EXPORTS DECREASE IN FEBRUARY.

Decided Slump from Average of Preceding Five Months—Also Decrease from a Year Ago.

Electrical exports from the United States fell off quite materially during last February as compared with the average of the preceding months. Even as compared with the corresponding month of 1917, which was the lowest month last year, the totals of last February show a decrease of over 3 per cent. The following table gives a detailed comparative study of the two months referred to, as made in the monthly report of the Bureau of Foreign and Domestic Commerce just made public.

Articles.	Feb., 1918.	Feb., 1917.
Batteries	$ 140,742	$ 227,105
Carbons*	148,776	.....
Dynamos or generators	247,028	277,953
Fans	21,955	66,243
Heating and cooking apparatus*	49,614	.....
Insulated wire and cables	270,334	526,879
Interior wiring supplies, including fixtures	109,894	72,524
Lamps—		
Arc	387	842
Carbon-filament	9,626	13,248
Metal-filament	228,866	153,475
Magnetos, spark plugs, etc.*	152,222	.....
Meters and measuring instruments	159,753	105,943
Motors	386,168	335,093
Rheostats and controllers*	8,520	.....
Switches and accessories*	210,643	.....
Telegraph apparatus, including wireless	24,601	18,324
Telephones	125,855	157,796
Transformers	125,240	84,105
All other	1,026,577	1,535,543
Total	$3,446,801	$3,575,073

*Not separately classified prior to July 1, 1917.

PHILADELPHIA ENGINEERS TO MEET.

The May meeting of the Philadelphia Section of the Association of Iron and Steel Electrical Engineers will be held on Saturday, May 4, at the Majestic Hotel. The program will include the presentation of a paper entitled "Electrically Operated Door Hoists for Open-Hearth Furnaces," by H. A. Lewis and W. H. Burr, electrical engineers of the Alan Wood Iron & Steel Company, Ivy Block, Pa. A special feature of the meeting will be an address entitled "Some of My Observations in France," by Maj. Wm. A. Garrett, who recently returned from "over there."

WISCONSIN STATE ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS.

Supplementary Report of Convention Held at Madison April 23 and 24.

The following supplementary report of the Wisconsin State Association of Electrical Contractors' and Dealers' convention, held in Madison, April 23 and 24, pertains especially to the second day's sessions; the first day's proceedings were covered by our report in the issue of April 27. The attendance on the closing day reached the maximum and this with the keen interest manifested made every one feel that the meeting was a success.

Address by John L. Acker.

The address by John L. Acker, president of the Acker Electrical Company, Sheboygan, on "Why the Electrical Contractor Should Be a Merchandiser," consisted of a plain statement of his methods in building up a contracting and merchandising business in the electrical line. Evidently Mr. Acker's underlying reason why a contractor should become a dealer is that the two branches may be successfully co-ordinated in building up a profitable business. His initial success in merchandising began 15 years ago when he inaugurated an electrical show and sold 165 electric irons and 25 motor-driven washers in three days. His successful sales, aided by effective displays, led to his taking over the appliance and fixture business of the public utility company operating in that field. The thing that led to this transaction was the fact that the Acker Electrical Company had sought and obtained close co-operation with the utility company, resulting in multiplying its sale of power. He not only divided up and displayed his goods in departments, so they could be seen, but established a rest room as a kind of welcome place for actual and prospective customers. His plan of showing goods is to turn a flood of light upon the special line the customer wishes to see, without specially illuminating other features. It was shown that Mr. Acker makes contracting and merchandising serve each other, and that in this case, at least, the power company was not anxious to stay in the merchandising field if it could co-operate with a successful concern that meets the demands of the trade by an aggressive, tactful policy. He discussed relations with the jobber, with whom the same co-operative spirit prevailed. Mr. Acker may not profess to be a psychologist, but it was evident to the members present that he understands the psychology of the electrical business. Many questions were answered in connection with the discussion that followed.

C. M. Jamison's Address.

The above was followed by an address on "Selling Electrical Appliances on the Installment Plan." R. B. Snyder, general sales manager of T. M. E. R. & L. Company, Milwaukee, who was announced to speak on this subject, was unable to attend the convention. His place on the program was taken by C. M. Jamison, manager of appliance sales department of the same company. Mr. Jamison said one reason for selling on the installment plan was that the public demands it, and the experience of that company was that 75 per cent of its sales are made on this plan. It results in an increase of sales, which are made on a higher price basis; and this plan, taken in connection with lighting service, established close relations with patrons. The matter of fixing prices to meet the additional expense of conducting an installment business was discussed. He laid special stress on seasonal sales and deemed it best to reduce the time for meeting payments, so that a fan, for instance, would have to be paid for before the winter season. As to washers and vacuum cleaners, the time of meeting payments might run without reference to seasons. Mr. Jamison had found the plan of having the dealer sell appliances, collect the first payment, and turn over subsequent collections to the manufacturer did not work at all satisfactorily. Of special importance is the training of salesmen, first, to see that they understand the articles offered, and then to help them get a survey of the customers' situation and adapt the sale to meet his needs. For instance, if 12 months' time is given on certain sales, it is not necessary to go the limit with a buyer who does not need so long a time for payment. The method of handling cases in which payments are refused was explained and discussed by other members. The first essential was to remove all causes of a just complaint. If a customer desires credit he should not refuse to

R. J. NICKLES,
State Chairman.

W. R. JOHNSON,
Treasurer.

JOHN A. PIEPKORN,
Secretary.

Men Who Are Putting the Goodwin Plan Across in Wisconsin.

sign a contract that empowers the seller to enforce a fair adjustment in extreme cases.

Industrial Plant Visited.

In the course of the automobile trip over the city of Madison, the members of the convention spent an interesting half-hour in the factory of the French Battery & Carbon Company, in which dry cells and flashlight batteries are being manufactured on a large scale. Over 100 persons are employed here, nearly half of them being women.

Paper by Paul C. Burrill.

One of the most useful contributions to the convention was that of Paul C. Burrill, secretary of Herman Andrae Electrical Company, Milwaukee, on "Overhead Expenses in Our Business." After preliminary statements, in which overhead expenses were defined, the speaker went into a close analysis of the subject as applied to this industry. Several charts were presented to illustrate three methods of computing overhead charges. An abstract of Mr. Burrill's paper, which speaks for itself, will be found in a later issue. There was a quite general expression of commendation concerning the plans presented. B. L. Burdick, Milwaukee, moved that the association have this paper printed in suitable form for distribution among the members, and that it be put forth as the Burrill Plan. H. P. Andrae, treasurer of Julius Andrae & Sons Company, Milwaukee, moved to amend by specifying that the matter be printed in such form as will fit into sales data books, and he offered to contribute $100 toward defraying the expenses of such printing. The amendment, including the acceptance of Mr. Andrae's offer, was adopted, as was also the original motion carrying the provisions named.

The last address was by John Hoeveler, a member of the Industrial Commission, which has prepared a code for standardizing industrial lighting. He explained the provisions for securing a uniform distribution of lighting in factories, to avoid injurious glare, deep shadows and uneven dispersion. One prohibition was against lamps without shades.

This association has 100 members at present, well distributed over the state. The rapid growth in membership and the prevalence of the co-operative spirit are largely due to the energy and tact of John A. Piepkorn, field secretary, Milwaukee.

MARKETS FOR ELECTRICAL GOODS IN THE FAR EAST.

Study of Conditions Shows Vast Opportunities and Manner in Which Japan Has Taken Advantage of Them.

Since the war much has been said about the wisdom of learning Spanish, and the vast opportunity offered by South American markets for United States goods. Little has been said about the enormous market, as yet almost dormant, that exists in the Far East. The opportunities of the Far East for electrical goods are calling, but as yet have received only a very faint-hearted answer by Americans.

According to R. A. Lundquist, consulting engineer, Minneapolis, and commercial agent, United States Department of Commerce, who has just returned from a tour of the Far East, including New Zealand and Australia as well as China, Japan, Strait Settlements and Siam, the markets of the Far East offer enormous possibilities for American initiative. The Electrical Review was fortunate enough to obtain from Mr. Lundquist some of the salient features of his study of conditions, and electrical conditions especially, in the Far East.

The East is awakening rapidly, a state of affairs accelerated by the war, which has given a great impetus to development in manufacturing in the East for eastern needs. And the awakening in China and Japan have assumed rather different forms. China is essentially the consumer, Japan the producer, of commodities such as electrical goods, machinery and similar wares. Since the war Japan has become quite a large exporter in the Far East, because competition has been largely eliminated due to fear of ocean raiders, submarines, shortage of ships, and so on, that have, in fact, combined to build up in favor of Japan what is virtually a tariff, enabling her to supply the requirements of the Far East. However, the markets that exist for Japan exist likewise for America, not in China alone, but also in India, Russia, Australia and New Zealand, markets that at present are supplied chiefly by Japan as far as electrical goods are concerned.

The war has, of course, largely eliminated European commercial activity, and entirely so German goods. Some of this trade will revert to European manufacturers after the cessation of hostilities, but meanwhile Japan is working strenuously to conquer the markets of China, India and Asiatic Russia and is spreading out to New Zealand and Australia with her goods. Perhaps the following statistics may serve to show, firstly, the extent of Japanese trade in electrical goods, and secondly, the effect of the war upon bringing Japan to the front as a producer.

ELECTRICAL EXPORTS FROM JAPAN TO CHINA.

	1916.	1915.	1914.	1913.	1910.
Copper wire	$591,605	$ 72,297	$ 83,288	$ 69,113	$ 26,516
Insulated electric wire	245,116	199,673	65,859	47,023	18,616
Electrical machinery and parts	175,027	127,270	134,139	124,420	26,102
Telephones	24,033	13,799	3,197	11,955	7,539

ELECTRICAL EXPORTS FROM JAPAN TO KWANTUNG PROVINCES.

Copper wire	$168,661	$ 38,285	$ 30,060	$ 11,088	$ 53,284
Insulated electric wire	106,513	96,330	95,715	76,220	34,794
Electrical machinery and parts	138,170	75,007	65,242	77,676	75,691
Telephones	16,331	8,957	4,849	10,905	9,002
Poles	6,531	5,078	17,784	.....	.....

ELECTRICAL EXPORTS FROM JAPAN TO HONG KONG.

Copper wire	$94,194	$10,306	$ 5,049	$ 9,455	$ 7,097
Insulated electric wire	9,341	30,290	4,735	2,418	.....
Electrical machinery and parts	20,612	15,729	6,451	6,475	756
Telephones	65	26	7	.....	.....

JAPAN'S EXPORTS TO BRITISH INDIA.

Copper wire	$186,312	$54,902	$ 804	.....	.....
Insulated electric wire	24,002	4,462	25	.....	.....
Electrical machinery	50,562	12,640	4,425	$ 9,337	$ 247
Telephones	154	120	30	.....	.....

JAPAN'S EXPORTS TO ASIATIC RUSSIA.

Copper wire	$ 8,640	$14,348	$ 1,794	$ 59	.....
Insulated electric wire	82,827	21,379	.....	.....	.....
Electrical machinery	167,246	10,784	.....	846	.....
Telephones	406,556	35	.....	.....	.....

During 1916 Great Britain purchased copper wire from Japan to the extent of $213,641, electrical machinery and parts valued at $52,184, while France spent $153,032 for the same purpose.

In addition to the above Japan supplied electrical goods, chiefly copper wire to Australia ($110,786), to New Zealand ($44,317), Siam ($49,291), Philippines ($8339), Dutch Indies ($43,233), Strait Settlements ($24,730) also doing a small business with Chile, Peru and Argentine.

Japan possesses large deposits of copper ore, and she is making the most of them. She already boasts of at least three large cable and wire manufacturing plants employing at least 2500 men among them, controlling the product from mine to market. She is also building turbogenerators up to 12,500 kilovolt-amperes under Parsons patents, also large waterwheel type generators and to some extent their prime movers. Another industry that she has taken up with great success is that of manufacturing porcelain insulators, an industry she is well able to take up with her large deposits of kaolin and the adoption of China's ancient ceramatic experience. Japanese insulators for low and high voltage are finding ready market in India, New Zealand and Australia, and Far East.

After telling of Japan's rapid advancement as a manufacturer of electrical apparatus, R. A. Lundquist gave some of his observations as to American goods and selling methods in the Far East. The Americans having faith in their wares tend to rely on their product to sell itself and receive fair treatment rather than pushing sales and trying to develop more trade. In other words, America has hardly encouraged and certainly not cultivated the Far East trade, except with very few exceptions, whilst Japan is working very hard to intrench herself strongly in India, Chinese and other markets.

In catering to the Far Eastern markets American manufacturers will find it very advantageous to have representatives on the ground who are familiar with conditions and Oriental customs and viewpoint. Such representatives would be able to assist American-made goods, assure their fair treatment, encourage their improvement through adaption to suit local conditions, and prevent Oriental trickery handicapping sales and unfair competition. Another fact brought out by Mr. Lundquist was that when heavy machinery made in America such as turbogenerators, water wheels, and so forth, is installed in China and elsewhere in the Orient, it is advisable to have an American or European familiar with American practices and apparatus on the job to superintend erection and placing of them in service. American goods are looked upon in some quarters unfavorably and jealously, because they are competitive, and absence of American interests permits carelessness and ignorance to breed dissatisfaction.

OHIO MEETING DISCUSSES TRANSMISSION AND DISTRIBUTION PROBLEMS.

April Meeting of Ohio Electric Light Association Discuss Lightning Protection, Railroad Crossings and Allied Topics.

The transmission and distribution committee of the Ohio Electric Light Association held its monthly meeting at the Ohio Hotel, Youngstown, Ohio, on April 18, 1918. The meeting was presided over by R. R. Krammes, Central Ohio Power Company.

The first paper was presented by V. E. Goodwin, lightning-arrester engineer, General Electric Company, Pittsfield, Mass., and was entitled, "Protecting Electrical Apparatus Against Lightning." This paper embraced a brief treatment of the normal lightning discharge and its nature. Five methods of protecting a power line were described as follows: First, overhead ground wires paralleling the transmission lines and supported by the same structures; second, the use of horn-gap arresters; third, the graded shunt multigap arresters; fourth, the aluminum cell lightning arrester; fifth, high-resistance ground. Mr. Goodwin described the method in which each type of arrester handles a discharge. He further pointed out the particular kind of protection advisable with various transformer installations. Transformers of 15 kilovolt-amperes or less capacity should be protected with compression type lightning arresters. Capacities from 15 to 150 kilovolt-amperes should be protected with the graded shunt multigap arrester. All installations having capacities greater than 150 kilovolt-amperes should be taken care of by the electrolytic type of arrester. Great stress was laid on the fact that the electrolytic arrester was the most sensitive and, further, required the greatest amount of care in handling.

The limit of discharge of the electrolytic arrester was placed at approximately one-half hour continuous. Should the arrester continue to discharge longer than one-half hour, the temperature of the arrester would become so great that the film necessary for the operation of the arrester would be dissolved and thereby reduce the resistance to the flow of line current. This condition is relieved considerably by introducing fuses in series with the horn-gap which automatically disconnect the arrester from the line when the current flow is so great as to damage the arrester.

Transformer overload protection should be obtained on the low-voltage side of the transformer installation rather than on the high-voltage side; further, all switching should likewise be carried on on the low-voltage side of the transformer.

Emphasis was laid upon the absolute necessity for establishing a special ground; in other words, no form of lightning arrester would be worth while without a good ground. The better the ground, the better the degree of protection. Mr. Goodwin also suggested that the lightning arrester should be located as near as possible to the apparatus it is to protect. He further pointed out that lightning arresters would only protect about four or five spans of line and therefore it would be extremely expensive to attempt to protect the line. Mr. Goodwin closed his talk by answering all questions pertaining to the use of lightning arresters.

A paper on the "Overhead Crossings of Electric Light and Power Lines" for voltages greater than 10,000 volts was read by M. H. Wagner, transmission and distribution engineer, Dayton (Ohio) Power & Light Company. This paper compiled in a detailed form the various specifications required by the operating railroads throughout the state of Ohio. Various requirements which were contrary to good practice were pointed out and, further, it was explained how they increased the hazards instead of reducing them, which is really the function of specifications. For instance, overhead rail clearance varied from 30 to 50 feet. Thirty-foot clearance of the rail should be ample in most cases and should not be increased for any other reason than contour of the crossing. To add to the height of the crossing adds materially to the strains imposed on the conductors and supporting structures and therefore to the hazards of the crossing. Another requirement, that of locating crossing structures 80 feet at right angles from each right-of-way line, thereby adding 160 feet to the width of the right-of-way for the crossing span, is contrary to all other specifications which lay stress in the point that the crossing span shall be as short as possible.

The next paper, entitled, "The Manufacture of Linemen," and read by M. H. Wagner, covered in forceful manner the education of linemen and the special need for such educational work at this time when the younger men are leaving to go to war.

Commercial

Electric Range Activities of Minneapolis General Electric Company—Effective Work Performed by Bureau of Safety

KEEPING IN TOUCH WITH YOUR ELECTRIC COOKING PROSPECTS IN WAR TIME.

Experience of Minneapolis Company That Electric Cooking Must Be Advertised Continuously.

By T. H. KETTLE,

Minneapolis General Electric Company.

Since April, 1916, the Minneapolis General Electric Company has been vitally interested in selling the electric cooking idea to the citizens of Minneapolis. Before that time electric cooking was practically an unknown method of food preparation, it only being used in about a dozen houses, sufficiently separated in an area of 60 square miles to make each installation a subject of curiosity.

However, in April of 1916 a very active campaign was started and continued up to the time the war really made itself felt in the electrical industry. During the campaign around 500 ranges were sold and with one or two exceptions have been doing yoeman service ever since.

Coming now to war-time conditions, the selling of the electric cooking idea for the last twelve months in Minneapolis has taken on the aspect of a general educational campaign, preparing the people, in a steady, persistent way, for an electric-range campaign that, saving unforeseen things, will undoubtedly be arranged when conditions become normal again. The condition of the money and material market at the present time quite naturally precludes any active campaigning of the electric range, except in isolated cases.

However, during the time the campaign was in force, hundreds of people became interested, but, as usual, never closed. These, together with other prospects, soon reached a total of 2000, and this was considered a representative body of possibilities on which to work during war times, to see if they could not be prepared for the electric cooking idea, if not during the war, then immediately thereafter.

PROSPECT LIST PREPARED.

In short, a prospect list of 2000 real, live, interested people, are being spoken to every other week by means of a recipe service, every mailing of which leaves just that much more of a favorable impression, and the whole series of which must ultimately sell them on the idea. To be sure, this recipe service is not meant to sell them now; it is just preparing them for something in the future, the theory behind the whole thing being that one of the inherent values of advertising is its cumulative, continuing force, and must go on continually, persistently and without interruption, if the campaign is to be a success.

After 20 of these recipe cards had been used, covering a period of almost a year, it was to be expected that some kind, or at least many kinds of impressions should have been made on the minds of the recipients. Of course, no one can receive 20 pieces of advertising matter from the same firm telling them something of vital importance in these war times without forming some kind of opinion about the thing being spoken of; accordingly, it was decided to try to find out just what impression this recipe service was having on the minds of the company's 2000 electric cooking prospects to whom it is hoped to sell the idea of better cooking.

KEEPING IN TOUCH WITH CUSTOMERS.

So here's the scheme:

A mailing card, with a return card attached, telling the prospects that the mailing list of the recipe service was to be revised and that only those sending back the card would receive the favorite recipes in the future, a small space being left for any remarks the prospect might care to make.

Did the scheme work? It worked beautifully!

Dear Madam:

The mailing list of our Electric Cooking Bureau's Favorite Recipe Service is being revised. A new list will be made from the attached cards that are returned. Every card returned will be entered on the new list.

Let us have yours today--now while you think of it! Thanks!

Any special remarks, or any particular recipe you would like us to help you with, just make a note of it under "Remarks."

THE ELECTRIC COOKING BUREAU

The Minneapolis General Electric Company

15 SOUTH FIFTH STREET

Main 6100 **Auto. 44210**

*Post Card Sent to Prospective Range Customers to Test Interest in Recipe Service. Over 500 Replies Were Received.

Four hundreds cards were returned out of the two thousand and over a hundred people called up and came in personally to make sure they would continue to receive the service! Some of the prospects even sent back the cards and also called up to make sure their names were placed on the new lists.

Altogether, this gave a return of about 500 names out of the 2000 that had really been brought to a point of depending on the service. As a matter of fact, these 500 people have been developed from possibilities into real prospects by a process of reiteration.

And now the question arises as to what to do with 500 people in order to sell them completely on the idea of electric cooking and at the same time keep the idea before them so that when the time does arrive to actually commence operations again, we shall not have lost any of the favorable impressions we have created.

A "Recipe Clipping Book" at once suggested itself; a conveniently sized book consisting of a dozen envelopes to hold recipes under various heads, such as meats, salads, cereals, soups, fish, etc., etc., and in which the owner could always have a convenient spot in which to place any recipes she had collected from time to time. On the front of each envelope are printed a few remarks on how electric cooking will improve the cooking of the recipes in that particular envelope. For instance, under meats we find:

"Electrically roasted meat is sweeter, juicier and more nicely browned. Steaks, chops and fish electrically broiled are par excellence!"

And now as to the distribution of the recipe clipping books. Miss Bell, the domestic-science expert employed by the company, is calling personally on every one of the above mentioned 500 interested prospects, and if conditions look favorable for the sale of a range the prospect will be presented with a Recipe Clipping Book, with a few appropriate remarks on how much better the recipes would turn out if prepared on the electric range. No arguments will be put forward for the immediate purchase of a range unless the line conditions are such as to require no expensive extension or additional capacity.

Out of the 500 cards returned over 100 filled in the space for remarks, the consensus of opinion being that the recipe service is great, is more than appreciated, that most of the recipes have been tried and found dandy; over thirty-five people requested special war-time recipes.

The results of this little scheme of cementing the kindly relations of prospects lead us to believe that in the not far distant future, electric cooking will be quite popular in Minneapolis.

EFFECTIVE WORK OF A BUREAU OF SAFETY.

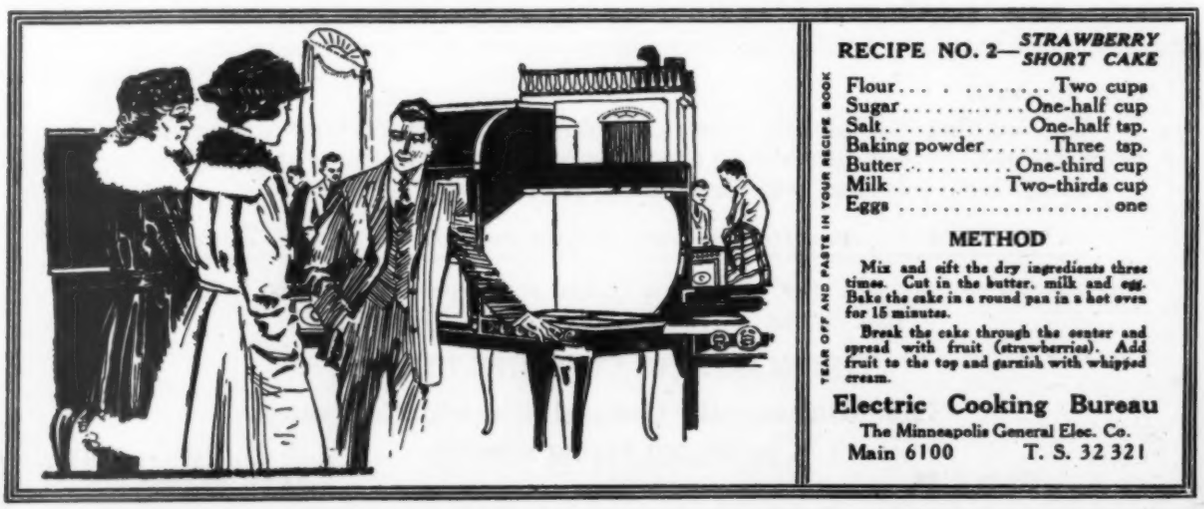
The Bureau of Safety is an auxiliary of the Middle West Utilities Company, Chicago, the scope and usefulness of which has been vastly extended. It was originated several years ago by C. B. Scott, of the Middle West Company, to handle inter-company insurance; and later its service was extended to the several Insull interests. It has developed into a safety organization, and as such serves fifty companies in 500 geographical locations. That is, this bureau directs and supervises safety operations at the plants of that many companies.

Its work is handled in three departments—Educational, Inspection and Statistical; and in this service 15,000 employees are trained. Special emphasis is laid on educational work affecting the individual, rather than the removal of physical hazards. The men involved are grouped in sub-organizations, and meetings are held to discuss safe practices and methods of insuring safety. Special attention is given to ways of improving public relations, this matter being of particular interest to meter readers and bill collectors, by way of improving their conduct toward those who are customers of the utility company.

Another service that is receiving intelligent attention is the Prone Pressure Method of resuscitating a person who has been paralyzed by an electric shock.

ELECTRIC COOKING IN COMMUNAL KITCHENS.

The communal kitchens, come into existence in Great Britain since the war because of their food-saving abilities, employ electric cooking to a large extent. Many of these feed many hundred people daily, while they also supply food which may be taken away to be eaten. Bakin ovens, ranges, steam tables, broiling plates and toasters are the usual electrical devices installed. Meals cost from about 5 cents up. It is claimed a good meal is obtainable for 20 to 25 cents. Electric cooking has been found admirably fitted for this work, and repeat orders and duplication of electric communal stations proves their suitability.


TEAR OFF AND PASTE IN YOUR RECIPE BOOK
RECIPE NO. 2—STRAWBERRY SHORT CAKE
Flour . . . . . Two cups
Sugar . . . . . One-half cup
Salt . . . . . One-half tsp.
Baking powder . . . . . Three tsp.
Butter . . . . . One-third cup
Milk . . . . . Two-thirds cup
Eggs . . . . . one
METHOD
Mix and sift the dry ingredients three times. Cut in the butter, milk and egg. Bake the cake in a round pan in a hot oven for 15 minutes.
Break the cake through the center and spread with fruit (strawberries). Add fruit to the top and garnish with whipped cream.
Electric Cooking Bureau
The Minneapolis General Elec. Co.
Main 6100 T. S. 32 321

One of the Series of Electric Cooking Recipe Cards Sent Out by Minneapolis General Electric Company to Prospective Range Customers.

Operating

Guy Anchors—Improving Gas-Fired Boiler Performance —Money Value of CO_2—Unloading 80-foot Poles Safely

CALCULATING HOLDING STRENGTH OF GUY ANCHORS

Development of Formula for Determining Depth of Anchor for Various Loadings and Soils.

By Gustav E. Jansson.

A pole or structure has frequently to be guyed against a pull, and as such guys must be anchored to withstand this pull, it is of importance as well as interest to know how deep down in the earth such anchors have to be buried in order to offer sufficient resisting moment for any pull that may be exerted upon them under the most severe conditions.

In the following, a formula is developed which will give fairly good results for general purposes. However, it must be kept in mind that the constants involved vary considerably, and care should therefore be taken that the correct constants are chosen. For instance, soil containing a large quantity of clay will have a much greater resisting moment due to its flexibility and high adhesive properties than dry sand, which will have practically its dead wegiht only, which will vary also with its moisture content.

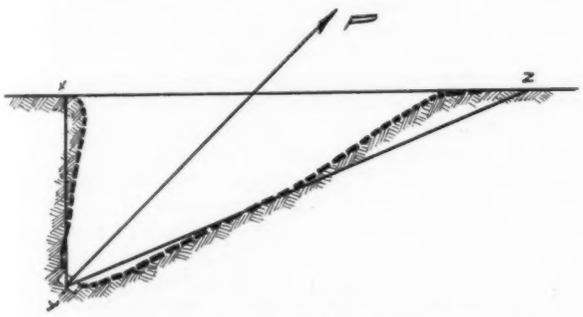


Fig 1—Diagram Showing How Guy Anchor Pulls Out.

In Fig. 1 is illustrated the way in which a guy anchor will be pulled out. Now, if δ is the angle of the guy wire with the earth, and the earth wedge resisting the pull is xyz, then the line yz will practically divide the angle δ in two. Hence, from Fig. 2 we obtain,

$$a = \frac{h}{\tan \delta/2}, \text{ and the area } A = \tfrac{1}{2}\, a\, h = \frac{h^2}{2 \tan \delta/2}$$

But the weight $W = wQ$, and $Q = lA$, thus,

$$W = \frac{w\, l\, h^2}{2 \tan \delta/2}$$

where w is the weight of 1 cubic foot of earth, and l is the length of the anchor bar.

Now the force necessary to overcome the friction of this wedge of earth on the slope yz is expressed by the equation

$$F_1 = f\, W \cos \delta/2$$

where f is the constant of friction or coefficient of friction.

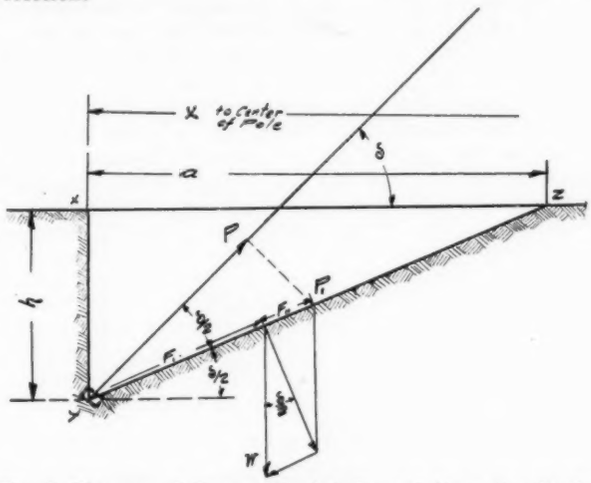


Fig. 2—Diagram of Forces Exerted By and Upon the Earth and Anchor.

The gravity force acting downward is given by,

$$F_{11} = W \sin \delta/2$$

hence the pull necessary to move the wedge upwards is,

$$P_1 = F_1 + F_{11} = W\,(f \cos \delta/2 + \sin \delta/2).$$

But as the pull on the guy wire is not in the direc-

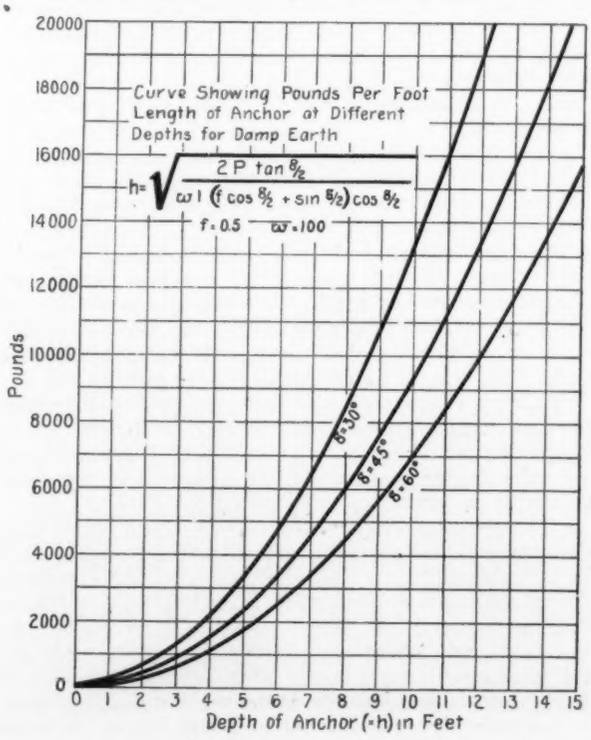


Fig. 3—Resisting-Moment Curves.

tion of the slope yz, the force P_1 must be reduced due to the upward direction of the pull, as is expressed by,

$$P = P_1 \cos \delta/2 = \frac{w l h^2}{2 \tan \delta/2}(f \cos \delta/2 + \sin \delta/2)\cos \varepsilon/2$$

The friction constant as given in engineering handbooks varies somewhat as follows:

Dry sand, clay and mixed earth.....$f = 0.4$ to 1.0
Damp clay .....$f = 1.0$
Wet clay .....$f = 0.3$

The curves in Fig. 3 give the values of the resisting moment in pounds per foot length of the anchor bar.

Assume, for instance, that a pull of 20,000 pounds at an angle of 45 degrees is to be resisted by an anchor of 10 feet in length, with a factor of safety of 5. We then have $5/10 \times 20{,}000 = 10{,}000$ pounds per foot length of anchor. From the curve for $\delta = 45$ degrees it is found that h is 10.3 feet, which is the necessary depth to which the bar is to be buried. The distance x from the center of the pole to the anchor is then expressed by

$$x = \frac{l + h}{\tan \delta}$$

where l is the height from earth to the guy wire on the pole.

IMPROVING PERFORMANCE OF GAS-FIRED BOILERS.

Because coal was thought plentiful and cheap it was allowed to be wasted. So, too, with natural gas, and it is only since the latter became scarce as the demand for it increased that serious effort has been made to burn gas efficiently. At the annual convention of the Oklahoma Gas, Electric and Street Railway Association held in Oklahoma City between April 22 and 24, L. A. White, superintendent, Muskogee Gas & Electric Company read a paper entitled "Gas-Fired Boilers" in which he brought out the salient points in operating gas-fired boilers.

He pointed out that the use of gas as fuel eliminates all the troubles incident to coal and ash handling that exists with coal, the greater convenience and lower initial cost of gas-firing apparatus, and the need for using gas as efficiently as possible now that the demands upon it are so great.

In using gas as fuel under boilers, the chief problem toward efficient combustion resolves itself into obtaining complete combustion with a minimum of excess air. The factors which govern combustion are time, space and complete mixture of oxygen with the gas. This should be accomplished by putting the gas and air in violent agitation before entering the combustion chamber, but due to the impossibility of reaching each atom of carbon with its share of oxygen when only the proper proportions are present it is necessary to supply an excess quantity of air.

The ignition temperature of Marsh gas being 1233 degrees Fahrenheit, combustion must be completed before the gases come in contact with the comparatively cool boiler tubes, therefore, the necessity of a large combustion chamber. It is not many years since it was thought necessary to burn the fuel as near the tubes as possible as though the heat might vanish if given time. The tendency of the present day, however, is towards higher boiler settings and larger furnaces ing, which means lower labor costs and longer hours and when these furnaces are constructed so as to prevent the flame from impinging on the tubes, it is feasible to drive the boilers 200 per cent of rating without difficulty.

Most of the boilers at Muskogee were originally coal fired and when gas burners were installed the grates were covered with fire brick, the burners placed in the furnace door and the flame directed against a checker work about 30 inches from the end of the burner. This arrangement proved to be satisfactory as long as the boilers were not driven hard, but as the demands on the boilers increased, the grates were removed, and ash pit lined with fire brick and finally most of the burners were placed in the ash pit doors, doubling the size of the combustion chamber and enhancing the capacity of the boilers. The theory of the checker wall was to assist combustion by presenting an incandescent surface to the gases, thereby insuring ignition and directing the hot gases at right angles against the heating surface of the boiler, the effectiveness of a square foot of heating surface being about eight times that of a similar area parallel to the gas flow, but the factor of time is left out of this speculation and what actually occurs is that the course of the gases is diverted and directed against the tubes where the gas is cooled below the temperature of ignition and combustion arrested.

In operating a group of boilers without steam flow meters it is quite possible to drive one or more of the boilers beyond safe limits unknowingly, due to the condition of the burners either in lagging or leading boilers. It is well known that the orifice of the burner sometimes becomes obstructed, thereby diminishing the flow of gas and necessitating cleaning. If this condition is not general the load will naturally shift to the other boilers and a high gas pressure will be carried to offset the delinquency. If the burner orifice is adjustable, it is likely to be thrown out of adjustment in the cleaning and result in over-firing.

The danger and proof of the fact that scale is not always the cause of tube burning is shown by an experience in the plant of the Muskogee Gas & Electric Company at Muskogee. A 500-horsepower B. & W. boiler equipped with 22 gas burners had been installed. The other boilers were of the same size and type, but equipped with 15 gas burners. On the first night's run with this boiler operating on the same line with 3 of the 15 burner boilers and pulling a 2000-kilowatt load, 12 tubes in the first row were burned out.

A gas fire should burn with a blue flame and white heat; the presence of a white flame indicates carbon monoxide. Of course, the only sure method of judging the efficiency of a furnace is with the Orsat apparatus, but without a collector for obtaining continuous sample or an automatic CO_2 recorder, maximum efficiency is likely to obtain only during the test.

AIR CONDITIONING FOR TURBOGENERATORS.

There are few factors influencing turbogenerator life and performance more than that of conditioning the air. Conditioned air—air that has been cleaned and washed and humidified—reduces the amount of dust and dirt carried into the generator, there to adhere and gradually clog up ventilating ducts, deposit on windings, there to pick up oil and foreign matter, causing grounds, dielectric failures and breakdowns, and offering opportunity for combustion should a fire start inside the generator. As less dirt is carried into the windings the generator requires less cleaning.

PLACING CO_2 ON FINANCIAL BASIS.

While most steam engineers understand that high percentages of carbon dioxide (CO_2) means high combustion efficiency, comparatively few appreciate the costliness of low CO_2, because of the waste of fuel due to incomplete combustion or excess air. The conservation of coal is now a patriotic act as well as one benefiting the pocket book, hence it behooves everyone connected with the combustion of fuel to endeavor to obtain maximum efficiency and therefore economy by using coal or other fuel as efficiently as possible.

Carbon dioxide is the one single important factor employed for indicating combustion performance, and while not giving complete information, as is obtained when oxygen and carbon monoxide are taken also, yet suffices to indicate whether too little or too much air is being fed to the fire. To assist those that would serve the nation in the way of conserving coal the Uehling Instrument Company, New York, has gotten up the accompanying chart for use by central-station engineers and other boiler-room engineers and managers. This chart is being distributed as a national service in the one patriotic cause of saving coal. By its use anyone is able to quickly and closely estimate the money being lost up the stack due to low carbon dioxide, the

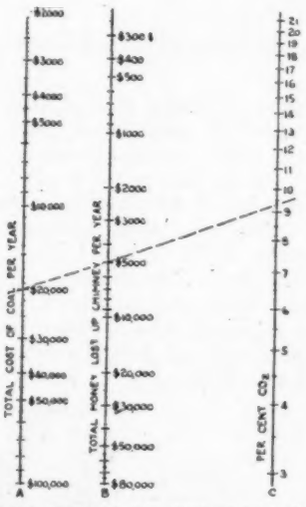


Chart for Determining Cost of Low CO_2.

phase of the matter that makes the matter most personal.

The object of the accompanying chart is to show that a high percentage of CO_2 is extremely desirable. To be sure, even where the CO_2 is as high as 21 per cent, the theoretical maximum, there is a loss because in the average power plant the flue gases leaving the boiler have a temperature around 500 and 600 degrees Fahrenheit. Loss therefore is inevitable unless a blower is used for exhausting the gases, and some sort of interchange system is installed for either heating the feed-water or preheating air and leading it under the grate.

The chart is based upon a flue gas temperature of 600 degrees Fahrenheit, and an outside temperature of 60 degrees. Where the flue gas temperature is higher or the outside air temperature lower, the money loss indicated by the chart will be correspondingly increased. On the other hand, with a higher outside air temperature and a lower flue gas temperature the money loss will be correspondingly reduced. Further, in the construction of this chart it is assumed that the coal has a calorific value of 14,000 B. t. u. per pound of combustible.

For example, suppose that $20,000 is spent annually for coal burned in a furnace whose average percentage CO_2 is 9.3 per cent. What is the approximate yearly loss up the chimney? Connect the $20,000 of column A with 9.3 of column C as indicated by the dotted line drawn across the chart. The intersection of this line with column B gives the yearly loss as being $5000.

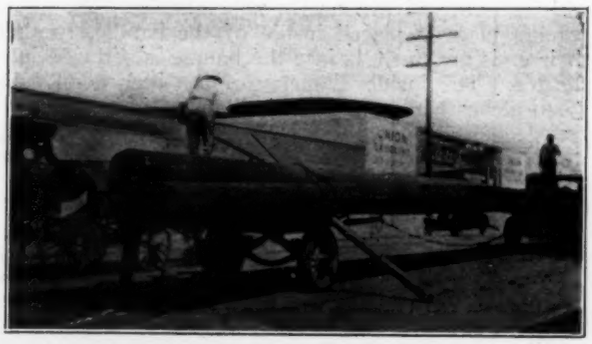
It might be of interest to point out that where there is as low as 3 per cent CO_2 in the flue gases, 76 per cent of the heat value of the coal passes up the chimney as waste under the conditions outlined above. It is, however, impossible for these gases to contain as low as 2 per cent CO_2 because for it to do so would require that more than the original quantity of heat contained in the coal were necessary to heat the enormous quantity of surplus air to the temperature assumed of 600 degrees Fahrenheit.

In keeping with the general movement toward efficiency most large power plants of today employ carbon dioxide recorders for recording automatically and continuously combustion performance, in this way keeping continual tab on firing conditions, for the information of firemen, managers or both, since the recorders may be installed in the boiler room or in office or both. Coal cannot be saved by the use of CO_2 recorders alone and the instrument records should be carefully watched and their indications acted upon, and adjustments made until the highest percentage of carbon dioxide is maintained as closely as possible.

SAFE METHOD OF UNLOADING POLES IN CITY STREETS.

By Charles W. Geiger.

In unloading 80-foot poles for use in transmission lines, the Los Angeles Bureau of Power and Light follows a safety precaution that is worthy of mention. In order not to endanger the life of persons walking along the street should a pole break away where poles are being unloaded, they are held in check by a rope, one end of which is attached to the side of the truck, and after being passed around the pole to be unloaded, is then wrapped around a drum on the rear of the truck. One of the crew holding the free end of the rope is able to control the movement of the pole, letting it travel down the skids at any speed and stop it at the edge of the street. In this way passers-by are not endangered due to a pole breaking away and rolling down the skids to the danger of pedestrians and vehicular traffic.



Method of Unloading Poles, Los Angeles Bureau of Power and Light.

Contracting-Construction

Croft Discusses Hickeys—Motor Repair Shops—Elevator Control Developments—Cost Keeping—Contractors' Doings

SOME COMMENTS ON CONDUIT BENDERS.

How to Improve the Ordinary Pipe-Tee Hickey—Description of Some Manufactured Hickeys.

BY TERRELL CROFT.

[*This is the second of a series of articles describing different types of conduit benders and commenting on their use. These articles form a suitable sequel to the seven articles on "Methods of Bending Conduit," by the same author, which appeared in the* ELECTRICAL REVIEW *of January 12 to February 23, inclusive.*]

Pipe-Fitting Hickeys are shown in Figs. 8, 9 and 10. These are also, in a sense, improvised tools but will give quite satisfactory service until they wear out. Each consists of a pipe-fitting tee, preferably malleable, of a size larger than the conduit to be bent, which tee is provided with a length of pipe, 3 feet to 3 feet 6 inches long, that serves for a handle. When in use, the conduit to be bent is slipped through the straight hole in the tee and the hickey is pulled toward the operator, who, in the meantime, holds a portion of the

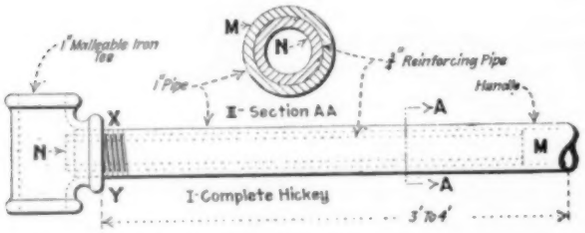


Fig. 8.—Method of Reinforcing a Malleable Tee Hickey.

tube on the floor by standing on it. For ordinary housework, as suggested in Fig. 8, a 1-inch tee is used.*

A Reinforced-Handle Pipe-Tee Hickey is detailed in Fig. 8. If the pipe handle of a hickey does break, the rupture will always occur at *XY* (Fig. 8) where the handle screws into the tee and where its available section has been reduced by the cutting of the pipe thread. If a piece of ¾-inch pipe or conduit *N* is driven in a 1-inch pipe handle *M*, into the position indicated in Fig. 8, the handle will thereby be reinforced at the plane of the greatest bending strain and will be rendered practically unbreakable. The reinforcing piece is placed inside of the handle, so that their ends are flush, before the handle is screwed into the tee. The inside diameter of a 1-inch conduit is 1.049 inches while the outside diameter of the ¾-inch

*Methods of using the ordinary hickey were described in Mr. Croft's articles in the issues of January 12, January 19, and February 9, 1918.

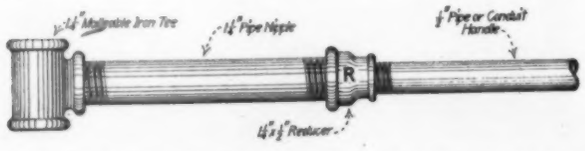


Fig. 9.—Pipe-tee Hickey With Working-End Fittings of 1¼-Inch Size.

conduit is 1.050 inches. Thus, the ¾-inch conduit is nominally 0.001 inch greater in diameter than the hole into which it is to fit. For this reason, it may sometimes be necessary to file or grind down the outside of

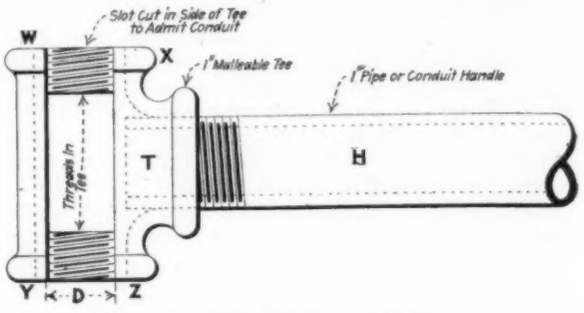


Fig. 10.—Home-Made Open-Side Hickey.

the ¾-inch pipe to insure that it will fit within the 1-inch pipe. On the other hand, since conduit tubes are not always rolled exactly to nominal dimensions, it frequently occurs that a piece of ¾-inch pipe or conduit can be found which will fit snugly within a 1-inch piece without its being necessary to reduce the external diameter of the ¾-inch tube.

A One-Half-Inch Pipe Handle for a Hickey can be provided as delineated in Fig. 9. Some wiremen prefer to use a ½-inch tube at the working end of the tool, because a pipe of this diameter fits the hand better than does a larger one. Such an extension could

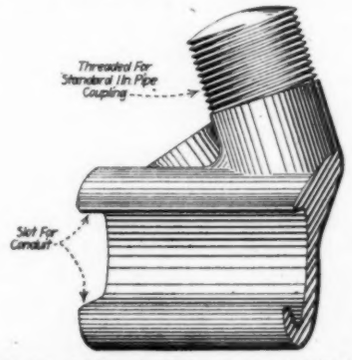


Fig. 11.—The Lakin Hickey. Made for ½ and ¾-Inch Conduit. (Thomas & Betts Company, New York City.)

be arranged by using, for example, a 1¼-inch by ½-inch reducer *R* as indicated in the illustration. Instead of the construction shown, a long ¾-inch pipe may be driven into a short 1-inch pipe which screws into the tee and thereby provide a working handle of smaller diameter.

An Open-Side Pipe-Tee Hickey, which, however, is not as durable as the regularly manufactured tool, may be improvised as outlined in Fig. 10. The head is made of an ordinary malleable-iron pipe tee by sawing a piece from its side. Thus, a lengthwise slot is

formed. As suggested in Fig 10, the slot *WXYZ* should be wide enough to admit easily the conduit which is to be bent. That is, for ½-inch conduit, the width *D* of the slot should be at least ⅞-inch. The provision of the slot results in the saving of considerable time as compared with the time which is required where a closed-side pipe-tee hickey (which must be slipped over the end of the conduit each time a bend is to be formed) is used.

The Disadvantages of Pipe-Tee Hickey Heads are that they slip on the conduit when they become worn. When new, the threads within the tee effectively grip the conduit which is being bent. But use flattens out the threads so that they will not bite. Another disadvantage is that, since the handle is rigidly attached to the head, the tool cannot be used in restricted locations in which a manufactured hickey head with an adjustable handle can be applied.

Manufactured Hickeys.

The Lakin Hickey is shown in Fig. 11. This is merely a head, inasmuch as a standard 1-inch-pipe handle, which is attached to the head by means of a pipe coupling, must be furnished by the purchaser. It is better construction to have the handle attached to the hickey head with a pipe coupling than to have the pipe handle screw into a threaded hole in the head. The reason is this: If the handle is screwed into a hole in the head and the handle breaks at the thread at the top of the head, it may be difficult to remove the short length of pipe thus broken off in the head. But, if a coupling is used, it may readily be turned off the head. Then a new coupling and handle can be attached.

The Anthony Adjustable Hickey is illustrated in Fig. 12. This head is of cast steel and has its jaw so formed that the conduit, when pressure is applied on the hickey handle, wedges in it, which tends to prevent slipping of the hickey on the conduit and at the same time holds the tube in the tool so that it will not slip sideways off the pipe. The swivel casting, to which the pipe handle is attached, may be adjusted to any one of five positions by 45-degree increments. This is a valuable feature, enabling the wireman to exert a maximum pull on the handle of the tool in any one of a number of different positions that would make awkward and difficult manipulation with an ordinary right-angle hickey.

The Fey Automatic-Grip Hickey is illustrated in

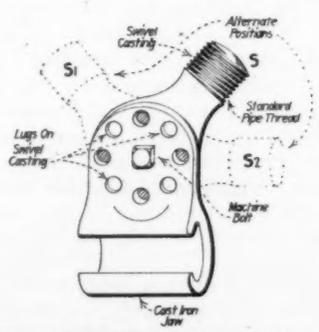


Fig. 12.—Anthony Adjustable Hickey. Made in ½, ¾ and 1-Inch Sizes.

Fig. 13. As suggested in the illustration, when the operator pulls on the handle of this tool a movable jaw automatically clamps the duct, which prevents the tool from slipping. Bends may be made by moving the handle in either direction. When moved to the limit in one direction, the handle will, when the workman starts to form the bend, make an angle of about 55 degrees with the conduit and in the other direction the angle is about 100 degrees. Thus two different starting positions for the handle are available, which permits the tool to be used in restricted locations where a rigid-handle hickey could not be applied. The pipe handle is held in the head by two square-head set screws. Thus the threading of the handle and the breaking which frequently occurs at the threads are

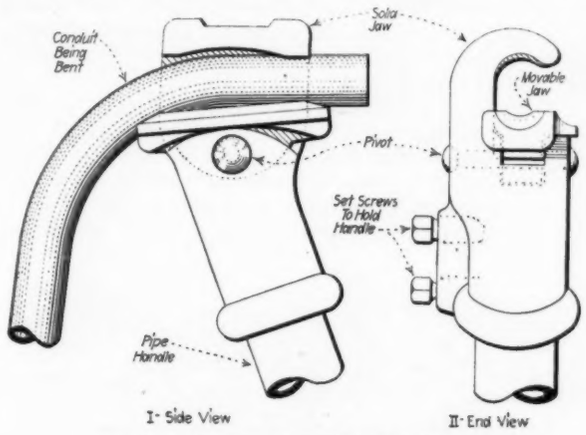


Fig. 13.—The Fey Automatic-Grip Hickey.

eliminated. The interiors of the jaws are smooth when the tool is new, so that the wear, due to bending conduit on the interior surfaces of the jaws, does not affect its utility. The price of the ½-inch size is $1.50.

(To be continued.)

GROWING FIELD FOR MOTOR REPAIR SHOPS.

Globe Electric Company, Chicago, Typical of Establishments of This Character.

The medium-sized electrical shop, handling a variety of work, including motor construction, repairs, wiring and installations, is everywhere in evidence, and is a factor in every locality where electric service is required. The shop typical of this class usually keeps within the sphere of shop work, contracting and special order jobs. The concern sells what it manufactures, but in all other respects is not a merchandising institution.

Attention might be called to many shops of this kind, one of which is that of Globe Electric Company, 6340 Stony Island Avenue, Chicago, managed by George Parradee. In the work of his shop the construction of motors of sizes from 15-horsepower down to the smallest size required is an important feature. While many motors are made for the general market, others are to fill special orders. For instance, within the last 18 months 150 ¾-horsepower motors have been made for the Garner Ventilating Company, Chicago, for direct-connection to its ventilating fans. These are 110 and 220-volt, single and 3-phase machines, required to run at 900 revolutions; and for some time the Globe company has been building the motors required for sand-roller floor-polishing machines, made in Chicago. This shop has turned out 100 small-sized motors per month, and its facilities for rewinding and other special repair work are equal to requirements. Another phase of its work is the manufacture of exhaust fans for electric drive, for which there has been considerable demand.

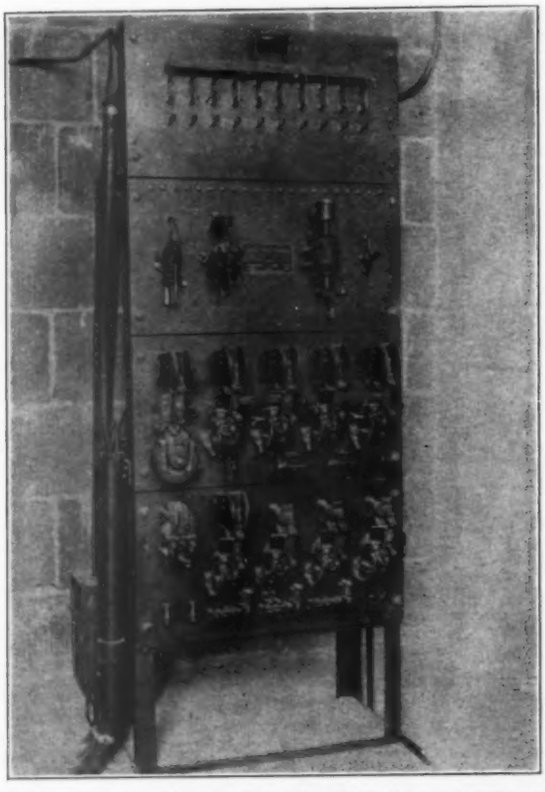
NEW FEATURES IN ELECTRIC ELEVATOR CONTROL.

By C. W. Geiger.

The Baker Iron Works, of Los Angeles, Cal., have recently built a number of elevators for the Los Angeles County Hospital with two types of control. They have both the automatic electric push-button control and ordinary hand-control switch. By means of a two-way switch mounted on the switchboard, either type of control can be had by simply manipulating the two-way switch.

With the automatic control, when the corridor button is pushed the car is automatically brought to the floor from which the button was pushed, but when the hand control is in operation, by pushing the corridor button, a call is shown on the annunciator.

In order to give patients, who may be operating



Control Panel for Electric Elevator That Can Be Operated Either by an Elevator Operator Through a Standard Car Switch or by the Passenger Through Automatic Push-Button Control.

the elevators when the automatic control is in service, plenty of time after the car has stopped at a floor in which to open the door, a time relay has been mounted on the switchboard. This can be so adjusted that from several seconds to a minute will elapse after a car has stopped at a floor, before the car can be taken away by any person on another floor. This will also prevent the operator from being in a hurry to get away from a landing, resulting in possible danger to passengers.

In the accompanying illustration is shown the control panel for one of these combination elevators. When the double-throw multipole switch shown at the top is thrown up, the automatic control is in service. When this switch is thrown down, the ordinary car-switch hand control is in service and the automatic cut out. To the right of the nameplate is the time-delay relay referred to above.

AN EFFORT TO STANDARDIZE COST KEEPING.

A system of cost accounting is being developed by the Wisconsin State Association of Electrical Contractors and Dealers for the use of such members as may not be satisfied with what they are using. The system soon to be presented is the result of adopting the most serviceable features of the plans in use by a number of the successful contractors. The main object is to standardize cost keeping on a plan that will make for clearness, simplicity and adaptability. In working up a system suitable to this line of contracting the association leaders realize how important it is to know costs.

AMONG THE CONTRACTORS.

Paul F. Harloff Company, Madison, Wis., recently did the wiring and installed a number of motors required at the city's new pumping plant.

C. Blodgett & Sons Company, of Mansfield, Wis., lately completed the wiring for light and power of the storage plant of the Automatic Refrigerating Company at that place.

The Martien Electric Company, 1225 Illuminating Building, Cleveland, Ohio, has been awarded the contract for electric wiring on the Detroit-Superior high-level bridge built by the County of Cuyahoga. The amount is about $8000. Wm. Stinchcomb, New Court House, Cleveland, is the engineer on this bridge.

The Johnson Electric Shop, Wausau, Wis., has wired the two new wings of St. Joseph's Hospital at Marshfield, Wis., and is putting in the conduits and wiring for the ornamental lights to illuminate the arched concrete bridge being built for the city of Wausau by the Wausau Iron Works; this is a 300-foot structure that will have eight clusters of lights.

Electrical Supply Company, L. W. Burch manager, Madison, Wis., has completed the wiring and minor fixtures for the new Madison Club building. This comprised conduit work throughout, furnishing outlets for lighting and power; and the installation of motors for ventilating and water supply. The contract amounted to $2500. This concern also is wiring the new Y. W. C. A. building and installing Moran-Hastings fixtures. This job amounts to $4100; the building is of steel frame with concrete and brick walls.

Robert J. Nickles, electrical contractor, Madison, Wis., has completed the electrical work on the new Physical Laboratory at the University of Wisconsin, which contract ran up to $17,000. This comprised wiring for lighting and power, and the installation of a number of motors required in the building. The structure is of reinforced concrete, the wiring being in Sherarduct conduit. The motors consist of both alternating and direct-current machines. Another important piece of work recently completed was the wiring for light and power of the new plant of the Northwestern Ordnance Company, Madison, in which field-artillery guns are manufactured for the Government. The power wiring was for 1200 horsepower in motors. The contract included supplying and installing 500 steel-reflector lighting units for overhead illumination. He also wired for a 50-kilowatt General Electric furnace required in gun-manufacture. Mr. Nickles' contract amounted to $25,000.

New Appliances

Plug—Electric Rubber—Drill Press—Circuit-Breaker—Charging Sets—Hole Digger—Canopy and Time Switches

NEW ATTACHMENT PLUG.

The Mueller Electric Company, Cleveland, Ohio, has placed on the market a new attachment plug, recently listed as standard by the Underwriters. The new device is designated the Mueller No. 4 Attacho plug in the company's descriptive matter. It consists of four parts, greatly simplifying the device without sacrificing any of its effectiveness. It embodies a solid

Mueller Attacho Plug.

plug with screw connections, a polished black head, a smooth shank and short-threaded shell, making the plug seat home in a socket with fewest number of turns, and with little cord twisting. It is small, highly finished and compact. With the threaded shell off, the inside of the plug is exposed, enabling one to see where he is threading the wires. Methods of connecting are minutely given in the company's folder.

A MOTOR-OPERATED RUBBING MACHINE.

The Mattison Machine Works, Beloit, Wis., has developed a motor-operated rubbing machine for wood surface finishing. It operates from the electric light socket with a current consumption approximating that of a few carbon incandescent lamps.

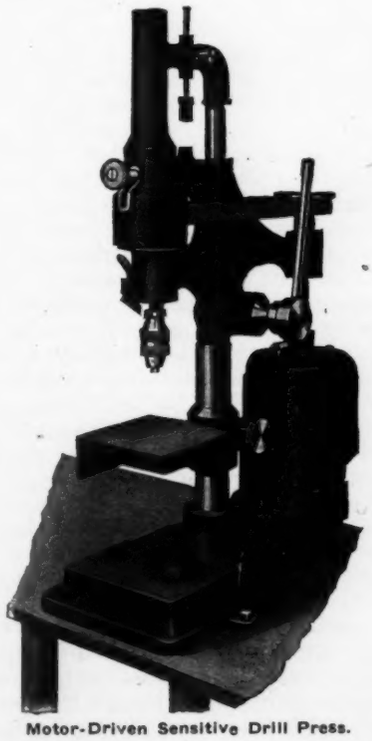
A fractional-horsepower motor made by the General Electric Company is supplied for the prevailing current. This motor moves the rubbing blocks together and apart at an even speed governed by the regulator, which is set according to the class of work in process.

The machine, which is inclosed in a dustproof aluminum case, weighs about 35 pounds and additional pressure can be applied by the operator, if necessary. It can be used for rubbing surfaces 15 inches in length and over and of practically any width. All wearing parts are of bronze or hardened steel and friction is eliminated practically by the use of ball bearings.

Electric Rubbing Machine for Furniture Finishing.

ELECTRIC SENSITIVE BENCH DRILL PRESS.

A bench drill press with several novel features has recently been developed by the High Speed Hammer Company, Inc., Rochester, N. Y. The press is suit-



Motor-Driven Sensitive Drill Press.

able for all work ranging from the smallest to a 3/16-inch hole. The height of the drill is 24 inches over-all and the base is 7½ by 18 inches.

The standard spindle speeds are 2100 to 6000 revolutions per minute, but special pulleys can be furnished

to give a main spindle speed of 10,000 revolutions per minute.

The drill is so constructed throughout as to insure great accuracy in the work. The main spindle is heat-treated and ground to size; it is guided through a bronze quill with an annular ball-bearing support at each end. End thrust is taken up by an end-thrust ball bearing under the feed arm. A depth gauge is also provided on the feed arm arranged so it can be locked in position.

A quickly adjustable table is provided which has a working surface of 5½ by 5 inches and will take work up to 4⅜ inches in height. The surface of the table is ground to insure accuracy and has a self-cleaning taper. The base is also provided with a ground working surface 4 by 6 inches and will take work up to 7½ inches in height. The base has an oil groove and self-cleaning column support.

The spindle lock permits quick changes of drills without making it necessary for the operator's hands to come in contact with belts or pulleys.

An idler pulley is provided for adjustment of belt tension. The front pulley and upper part of the spindle are protected by a semitubular guard. The machine can be operated by foot or hand control. The outboard motor bearing which supports the spindle for the driving pulley is provided with a self-alining ball bearing. The drill is equipped with a 1/10-horsepower, vertical Robbins & Myers motor.

SELF-TIMING CIRCUIT-BREAKERS.

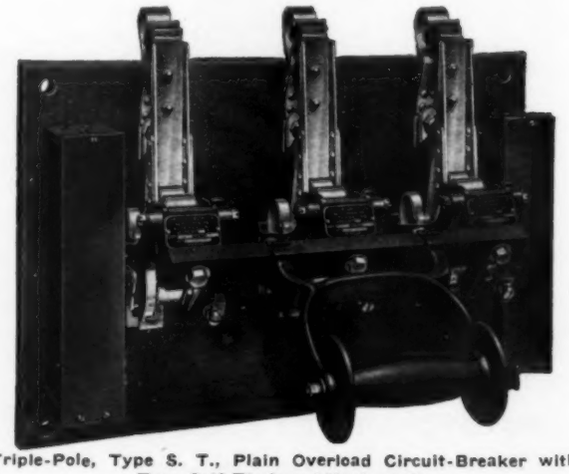
Complete protection of the electric motor is beyond the capability of the ordinary instantaneous-trip circuit-breaker. The requirements of motor protection are shown in the following: The normal starting current of a motor is well in excess of the value which is the limit of safety for continuous operation. During the starting period the tripping point of the circuit-breaker should thus be just above normal starting-current value, tripping if that value is exceeded but otherwise remaining closed. If, however, through faulty apparatus or faulty manipulation, starting-current strength is applied too long, the motor would be injured by overheating. The length of time for which the setting remains at the starting-current point must thus be limited to that for which the motor can carry that current without injury. If, with these conditions met, the motor has now been brought to speed, the breaker setting should change itself so that if the normal load current (which is obviously a fraction of starting current) is continuously exceeded, the circuit will be interrupted. Thus far the problem can be met by the employment of special dashpot type retarding means applied to the tripping mechanism. A further requirement is, however, present.

Take the common occurrence of a motor intermittently loaded. For such loads its safe maximum horsepower capacity is evidently greater than with load continuously applied, and, if the installation is to be economical in cost and in operation, that capacity should be utilized. Dashpot delaying means fail to permit this in that they are necessarily restricted to short-duration swings. The ideal is a circuit-breaker tripping point varying with changes in motor-winding temperature (that temperature being the limiting element of motor capacity) combined with ever present provision for an instantaneous trip in the event of an accidental overload which might cause mechanical damage before its heating effect had time to appear.

The new Roller-Smith type S. T. (Self-Timing) circuit-breaker meets each of these needs. Its operation is extremely simple. The breaker itself is of standard construction, tending always to trip instantaneously with the load, for which it is adjusted, applied. Interposed in the path of its trip armature is a pivoted hook-shaped barrier under two independent controls. One control is thermal. The expansion of a metal rod heated at the same rate the motor is heated, by the passage of the same current which drives the motor, retracts the barrier and allows the breaker armature to trip if the heating is excessive, no matter how that excess comes about. This thus cares for the starting current and the variable motor-loading protection requirements. The other control is electromagnetic, instantaneously retracting the barrier and allowing instantaneous trip if a heavy overload occurs. This takes care of the requirement that there shall be no delay should a mechanically dangerous load be suddenly applied.

Both controls are adjustable, that is, both maximum current which may continuously flow and emergency overload trip values may be independently varied by the purchaser, if desired. As sent out, however, they are set to cover the characteristics of the average motor of their normal ampere capacities and require no further adjustment.

These circuit-breakers are furnished in the standard type only and in capacities from 5 to 200 amperes, inclusive; for potentials up to and including 600 volts; for both direct and alternating current; in one, two, three and four-pole units, and for either switchboard

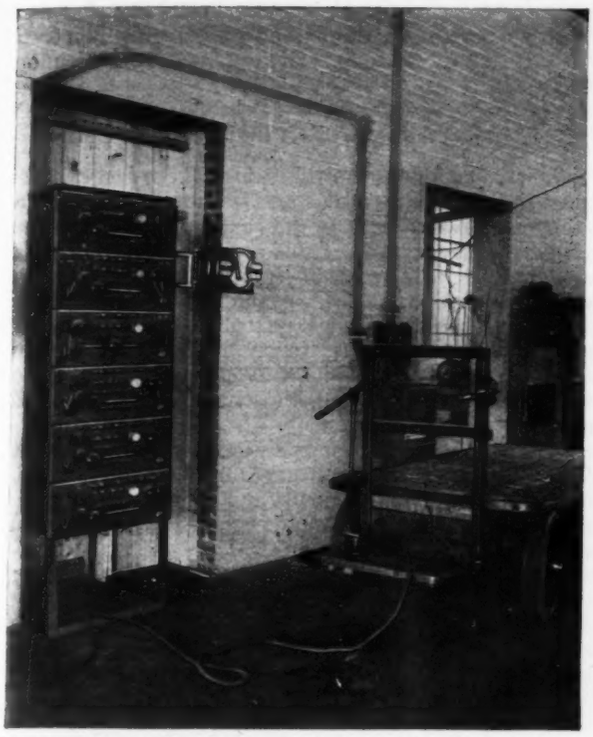


Triple-Pole, Type S. T., Plain Overload Circuit-Breaker with Two Self-Timing Attachments.

or wall mounting. They are supplied in the plain overload type and in the combined overload undervoltage and combined overload shunt-trip types. They the manufactured by the Roller-Smith Company, 233 Broadway, New York City.

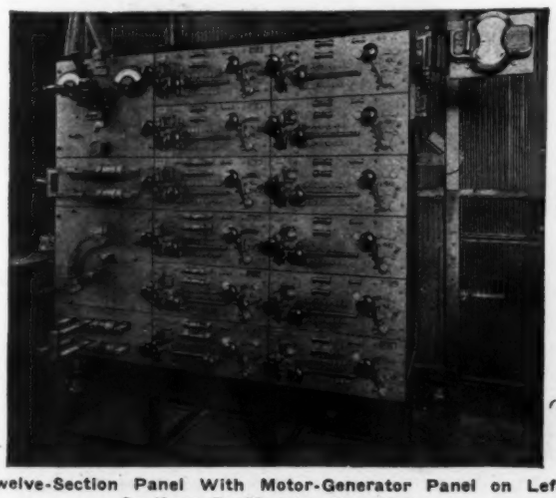
BATTERY-CHARGING INSTALLATIONS FOR INDUSTRIAL TRUCKS.

The C-H sectional battery-charging equipment which has been referred to previously in the ELECTRICAL REVIEW has been widely adopted during the past two years for charging the batteries of industrial electric trucks, mine locomotives and tractors. The accompanying illustrations show typical installations of this equipment. The smaller equipment is a standard six-section panel recently installed in the plant of Johnson & Johnson at New Brunswick, N. J. One of their electric trucks which is partially shown in the illustra-



Standard Six-Section Panel at Plant of Johnson & Johnson, New Brunswick, N. J.

tion is being charged from the third section from the top. The larger equipment is a 12-circuit board consisting of two standard six-section panels. The left-hand panel is of the same dimensions but is equipped with control equipment for the operation of a motor-generator set supplying direct current to the charging sections. These charging panels are built much like the present-day efficient sectional bookcase. Each section has a grid resistance mounted on the back of the slate and control switches, fuses and slider rheostat head on the front. Each section is a complete self-contained unit providing everything necessary for the proper charging and protection of the battery. A standard panel, like the one shown, will hold from one to six sections, and where more than six sections are required two or more panels can be bolted together. The dimensions of the sections and panels are standardized, hence future space requirements can easily be figured. The back of each panel is provided with vertical busbars which are furnished with copper lugs for making connection to the supply wires. Two lugs are also provided on each section to which the battery leads are connected.



Twelve-Section Panel With Motor-Generator Panel on Left, Southern Pacific Pier, New York.

As alternating current is used throughout the plant of Johnson & Johnson, a motor-generator set, consisting of an alternating-current motor and direct-current generator, was installed to supply direct current for battery charging. The 12-circuit panel is installed on Pier No. 49, North River, New York City, owned by the Southern Pacific Railroad. This transportation company also owns and operates a number of steamships. At Pier No. 49 they now have a total of 21 industrial trucks in service. These trucks are used to carry material in and out of ships, working directly from boat to pier and thence to barges or conveyances nearby. The freight handled consists mostly of copper in pigs, molasses, resin and sugar in barrels, cotton in bales, and other similar material. The trucks are also used as tractors to draw a number of trailers about the unloading pier. This company had but 12 trucks when the charging equipment was installed; since then they purchased additional trucks from time to time until now they have a total of 21. They are charged at night by filling the board to its capacity of 12 trucks and then replacing each truck as its battery comes up to full charge. In two years under this severe service not one part of the charging boards has been replaced.

Both of the charging equipments described above were furnished by The Cutler-Hammer Manufacturing Company of Milwaukee and New York.

NEW MACHINE FOR BORING POLE HOLES.

To overcome to some extent the serious shortage in labor, the Earth-Boring Machinery Company, Chicago, Ill., has developed and placed on the market a pole-hole boring machine that is of especial interest to utility companies.

The machine and some of its details are shown in the accompanying illustration. The boring machinery is mounted upon a steel roller-bearing hub truck which has a weight-carrying capacity of 10,500 pounds. It consists of a turntable, 5 ft. by 12 ft., upon which is mounted a series of gears, sprockets and clutches connected by chains to a tower arrangement by means of which the turning power and pressure is applied to the earth auger. The tower may be lowered so as not to come in contact with low bridges, wires, etc., when the truck is moved.

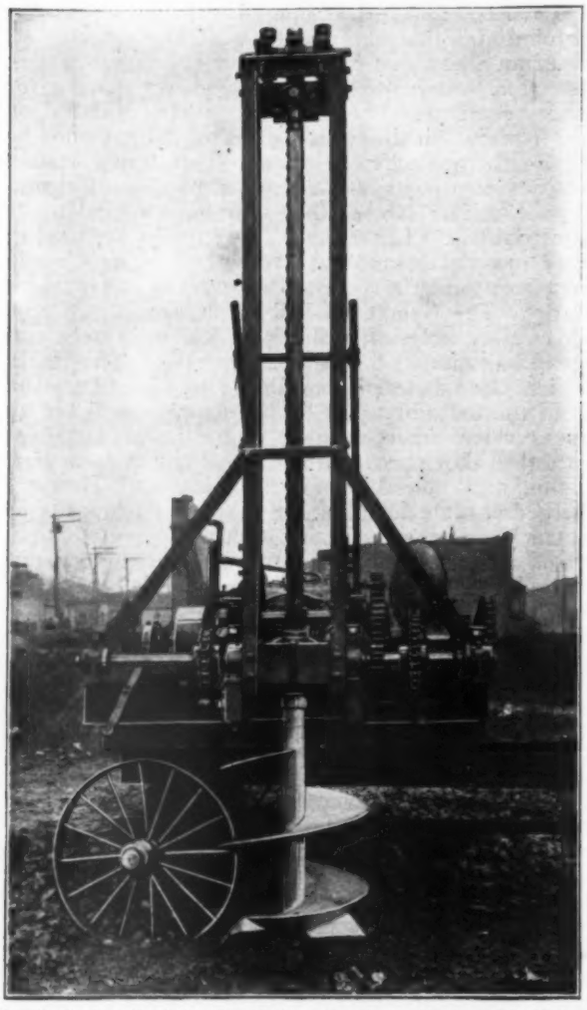
The equipment is so balanced upon the turntable that it may be swung around to any point of boring and also may be adjusted for boring on hills or inclines at an angle of 15 to 20 degrees.

The motive power for this particular model consists of a 40-horsepower motor. Its connection with the gearing of the boring equipment is by means of a heavy sprocket chain.

Two levers are provided for operating the auger, one controlling the speed and the other for raising and lowering the auger. When boring in the ground, the speed is about 10 feet a minute and when raising from the hole 25 to 50 feet. The machinery is controlled from the point of boring at the rear of the turntable, as indicated in the illustration. When boring, the auger is cleared of earth from the hole through centrifugal force. Only two men are required for operating the machine.

One of these efficient earth-boring machines

was recently purchased by the Government and before being shipped was submitted to some very rigid tests. In the tests of the machine illustrated, 24-inch holes 6 feet in depth were bored through clay and rock in 4½



Earth-Boring Machine Mounted on Truck for Boring Pole Holes.

minutes. In the final test which took place at West Grand and Kedzie Avenues, Chicago, holes of the same dimensions were bored in clay soil in from 1½ to 2 minutes; in loam, sand and rock, in three-fourths of a minute. In all these tests there was severe stress and strain to which the machine stood up satisfactorily.

A test has been made of digging the hole in adobe and hard-pan soil and placing the pole, the time being five minutes. The efficiency of the earth-boring machine is claimed to be an average of 100 poles in a 10-hour day or 10 poles an hour. This includes digging the hole, setting the pole and moving from one point to another.

Provision is made for equipping the earth-boring machine with a derrick for raising poles from the ground and lowering them into the holes. Augers of various sizes from three inches to 30 inches may be used with satisfactory results. The holes bored by this equipment are uniform and clean cut and the soil removed from the holes is well broken up for tamping purposes.

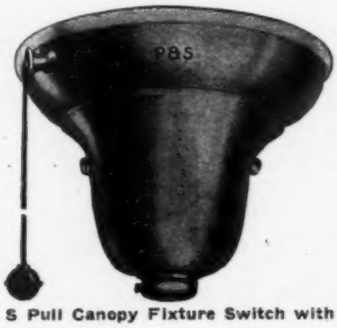
In addition to the use of the machine for pole-line construction work, it may be advantageously utilized in digging trenches for underground conduit. For this purpose a series of holes, close together, may be bored and then the intervening walls removed, thus forming the trench.

PULL CANOPY FIXTURE SWITCH.

Where individual control is desired for large, high-hung, pendant lamps it has been customary to place a ceiling pull switch next to the canopy from which the lamp or fixture is hung. This involves additional time and trouble in installation and always looks like a patched-up job. These disadvantages are overcome in a neat and compact device just placed on the market by Pass & Seymour, Inc., Solvay, N. Y. As shown in the illustrations herewith, it is a combination of a canopy and a pull switch, thus making a simple and attractive unit.

The P. & S. pull canopy fixture switches are built very substantially. The strength of their construction is more than ample to support and control any mogul-base lamp or the largest industrial and commercial units now rated at 1000 watts. The base is of porcelain and is arranged so it may be used on either 3¼ or 4-inch outlet boxes. It is provided with a flange that prevents grounding of the brass canopy even when used on metal ceilings or walls. Consequently it requires no separate insulating ring, nor a crowfoot or insulating joint.

Wiring of the new device has been given special attention. It is done with great ease and saving of time. The line terminals are arranged especially for loop wiring and are fully ½ inch from the surface wired over. The line wires can be looped directly over the terminals of the unit without a break or splice, thus making



P & S Pull Canopy Fixture Switch with Nipple.

Canopy Switch Open to Show Simplicity of Wiring.

a safe, neat and quick wiring job. The fixture or drop cord likewise is very quickly wired, since all that is needed is connection to the cord terminals and turning the cord up over a special porcelain cord grip directly over the terminals. This saves putting a knot in the cord and relieves strain from the terminals, which are readily accessible on opening the canopy.

The canopy of the device is of neatly finished brass. It has on opposite sides two neat buttons, pressure on which between thumb and finger releases twin spring lugs and instantly permits the canopy to be removed without use of any tools. The canopy can be as readily snapped into position again, where it will be rigidly held in place. The canopy is made with either a ⅜-inch female nipple or a porcelain bushing. The former can take either a fixture loop or stem, while the latter can accommodate long heavy cord, or fancy silk or velvet-covered cord for high-class pendants. Each type can support the heaviest fixtures permitted in this class of construction and has been tested to 100 pounds. The switches are rated 10 amperes, 125 volts; 5 amperes, 250 volts.

PARAGON TIME SWITCHES.

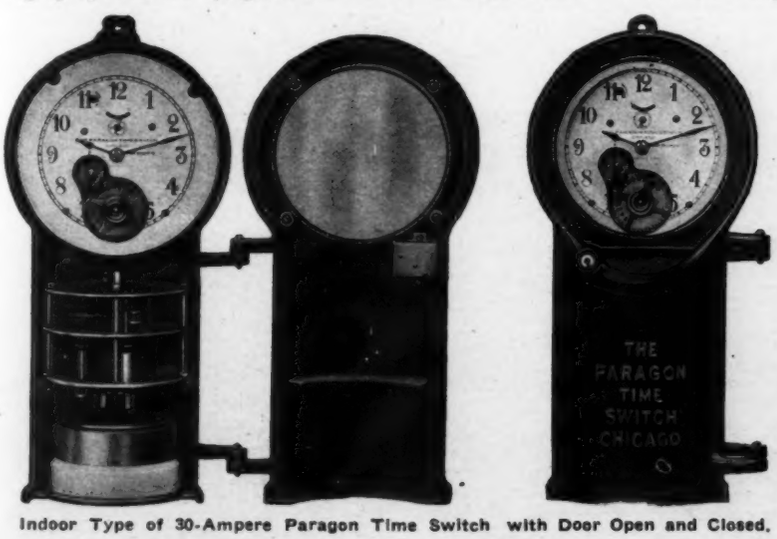
The increasing shortage of labor is causing more consideration to be given to every device that does automatically what formerly had to be attended to by some individual. Time switches have long been on the market, but prevailing conditions emphasize their value as never before. They have been used for many years for controlling store-window and sign lights especially without requiring an employe to visit the premises late at night to turn the lamps off; they have also been used for many other purposes to a less extent perhaps, but war times require that they be used for these miscellaneous purposes much more generally.

This situation makes it timely to describe a line of these switches that has met with much success. Time switches made by the Paragon Electric Company, Old Colony Building, Chicago, Ill., are the ones referred to. They are made in several types some of which are illustrated herewith. Each device consists of four simple elements: a good clock mechanism, a setting device by which the time of closing and opening the switch can be predetermined, a powerful spring motor for actually operating the switch, and the switch itself. Each of these parts is of sturdy and dependable construction, and being of either standard or at least not highly specialized design, the whole outfit is quite inexpensive. The view showing one of the indoor type switches open shows the simplicity and compactness of the arrangement.

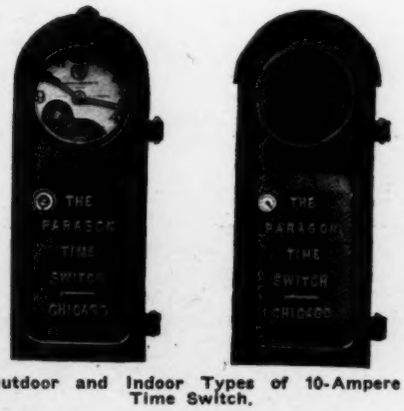
The clock is a standard eight-day jeweled timepiece with lever escapement and non-rusting hair-spring. The motor that operates the switch is a powerful, but simple, spring motor that also requires rewinding only once a week. The switch itself is a standard rotary snap switch. Each part is practically independent of the others, so that the clock or spring motor can be readily removed from the case and cleaned by any clock maker or repaired without interfering with the switch proper. The latter can be wired to or disconnected from the circuit without interfering with the clock or motor. Each switch with its timing and operating mechanism is mounted in a substantial iron case with dustproof door. The outdoor models have a special weatherproof housing; this may be provided with a thermostatically controlled electric heat coil connected across the circuit so as to prevent the oil in the mechanism from stiffening in very cold weather and thereby interfering with the operation.

Paragon time switches are made in two sizes, for 10 and 30 amperes. In case a heavier current is to be controlled the 10-ampere size is used to govern a remote-controlled switch; this prevents the expense and loss otherwise caused by wiring the heavy circuit right into the time switch, which may be located at any desired point convenient for setting and rewinding. Each regular switch is arranged to close and open the current each 24 hours, operating either twice or four times daily. An attachment can be provided for permitting the circuit to be closed by hand earlier any day than set and this without disarranging the schedule for opening the circuit automatically. Another attachment is available for permitting automatic opening of the circuit later on one day, as on Saturday night, for instance. Still another attachment permits shutting off the operation of the switch on one day entirely, as on Sunday, for instance. By means of these and other special attachments, it is possible to make the time switch operate a simple or complicated schedule more reliably than by personal attention.

While these time switches have heretofore found their greatest use in controlling store window and sign lighting, they have also been used (and doubtless will now be much more used because of the conditions mentioned above) for controlling special ornamental street lighting instead of sending around a special patrolman twice each night, and for many other uses.



Indoor Type of 30-Ampere Paragon Time Switch with Door Open and Closed.



Outdoor and Indoor Types of 10-Ampere Time Switch.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

RUTLAND, VT.—Rutland Railway, Light & Power Company has received a contract from Mahar Brothers for supplying additional power to their plant amounting to 25 horsepower.

SPRINGFIELD, VT.—Colonial Power & Light Company has completed the construction of its new transmission line from Windsor to Claremont, N. H., and operations have been inaugurated.

BOSTON, MASS.—New England Telephone & Telegraph Company, 50 Oliver street, has had plans prepared for the construction of a one-story telephone building, about 26x28 feet, at Manchester, Vt.

PALMER, MASS. — Wright Wire Company, 69 Hammond street, Worcester, is having plans prepared for the construction of a local one-story and basement power house, about 100x125 feet in size. Griggs & Myers, 110 West Fortieth street, New York, are architects and engineers.

BRIDGEPORT, CONN. — Bryant Electric Company, 1421 State street, has had plans prepared for the construction of an addition to its plant, about 60x125 feet in size.

BRIDGEPORT, CONN.—United Illuminating Company, 115 Broad street, has awarded a contract for the proposed alterations and improvements in its local power house. The New England Iron Works, 94 Commerce street, New Haven, is the contractor.

HARTFORD, CONN.—Arrow Electric Company has commenced the construction of a three-story plant, about 80x125 feet in size, on Hawthorne street. W. J. Sexton, 144 Allyn street, Hartford, is the building contractor.

THOMPSON, CONN. — Grosvenor Dale Company has filed plans for alterations and improvements in its one-story and basement water power plant. Contract for the work has been awarded to the J. W. Bishop Company, 109 Foster street, Worcester.

BUFFALO, N. Y.—The city is arranging the final schedule of streets for the extension of the district for the installation of underground electric conduits and the removal of the overhead lines. The improvements will be made by the Buffalo General Electric Company, the New York Telephone Company, and other public utilities operating in this section.

BUFFALO, N. Y.—Robertson-Cataract Electric Company, 151 West Mohawk street, has subscribed $50,000 to the Third Liberty Loan.

BUFFALO, N. Y.—The State Legislature, Albany, approved the consolidation of the Hydraulic Power Company, Niagara Falls Power Company, and the Cliff Electrical Company.

NEW YORK, N. Y.—Bell Telephone System has subscribed a total of $5,000,000 to the Third Liberty Loan, and subscriptions totaling $3,000,000 have been received from the Western Union Telegraph Company.

NEW YORK, N. Y.—Electric Bond & Share Company, 71 Broadway, has subscribed $200,000 to the Third Liberty Loan.

NEW YORK, N. Y.—A total of $20,000 has been subscribed to the Third Liberty Loan by the Electrical Securities Corporation, 71 Broadway.

NEW YORK, N. Y.—Tucker Electric Construction Company, 114 West Thirtieth street, has been awarded a contract for the electric work in connection with the construction of a large new tuberculosis hospital to be located at Massapequa, L. I., by the Board of Supervisors of Nassau county.

SYRACUSE, N. Y.—Crouse-Hinds Company, Seventh, North and Wolf streets, manufacturer of electrical appliances, has subscribed $12,000 to the Third Liberty Loan on behalf of its employes.

SYRACUSE, N. Y.—Syracuse Lighting Company, 339 South Warren street, is considering plans for the immediate construction of an electric plant. James B. DeLong is president.

WATERVILLE, N. Y.—Waterville Gas & Electric Company is considering plans for the construction of an electric plant at Syracuse. Bert H. Shepard is president.

ATLANTIC CITY, N. J.—Atlantic Coast Electric Light Company has filed application with the Board of Public Utility Commissioners for permission to increase its rates for service from ten to twelve cents per 100 kilowatts, the new schedule to become effective May 1.

BAYONNE, N. J.—Babcock & Wilcox Company, manufacturer of boilers, etc., has subscribed a total of $230,150 to the Third Liberty Loan.

BAYONNE, N. J.—Electric Dynamic Company, Avenue A, has subscribed $9,000 to the Third Liberty Loan.

BORDENTOWN, N. J.—Plans are under consideration by the city commission for the installation of electrically-operated pumps at the local water works.

CAMDEN, N. J.—Kind & Lantesmann have taken out a building permit for the construction of a brick boiler plant at the head of Fifth street.

CAMDEN, N. J.—National Electric Company, 417-19 Market street, has filed notice of the dissolution of the company.

DOVER, N. J.—New Jersey Power & Light Company has contracted with the New Jersey Slag Products Company for supplying additional power to its plant in the amount of about 100 horsepower.

HAMBURG, N. J.—Township Committee is considering the installation of an electric street-lighting system.

HOBOKEN, N. J.—Lux Manufacturing Company, Fifteenth street, manufacturer of nitrogen and tungsten lamps of 1000 to 1500 watts in size, has acquired one of the buildings at the plant of A. Hollander & Sons, 123-133 East Kinney street, Newark, which it will use as an extension to its works. A. P. Baldwin is president and treasurer of the company.

NEWARK, N. J.—Plans have been filed by A. Fink & Son, 810 Frelinghuysen avenue, for the construction of a one-story brick engine plant at their works.

PERTH AMBOY, N. J.—Standard Underground Cable Company, manufacturer of electric conduits, cables, etc., has acquired a large tract of land in Ideal Park, Woodbridge Township, comprising about 35 acres, for a consideration said to be about $39,000. It is said the company is considering the construction of a large new plant on the property.

PHILLIPSBURG, N. J.—Town Commissioners are considering improvements in the electric street-lighting system.

POMPTON LAKES, N. J.—Common Council recently passed an ordinance providing for a bond issue for $46,000, for the purpose of constructing a power plant on Corning Lake.

ALTOONA, PA.—Altoona Storage Battery Company, 802 Chestnut street, has had plans prepared for the construction of a one-story addition about 50x130 feet, to cost $10,000.

EASTON, PA.—Pennsylvania Utilities Company has commenced work for the foundations for the new 10,000-kilowatt turbine to be installed in its plant on Dock street. It is expected that the new unit will be ready for operation by August 1.

HARRISBURG, PA. — Schuylkill Electric Company, which operates in Schuylkill and Columbia counties, has filed with the Public Service Commission a new schedule of rates making increases to be effective May 16.

HARRISBURG, PA.—Employes of the Harrisburg Light & Power Company have subscribed $13,500 to the Third Liberty Loan.

HAZELTON, PA.—Lehigh Valley Coal Company is said to be considering the complete electrification of its mines in the Lehigh field. It is planned to convert the Oneida No. 4 slope from steam to electrical machinery during the summer, and work has been completed on the electrification of the Gowan and Wolf mines.

MANORVILLE, PA.—Triple Airless Tire Company, Pittsburgh, Pa., has commenced the construction of a pow-

er house in connection with the construction of a local plant, the entire work to cost about $85,000. Herbert & Henderson, Kittanning, are the architects.

MIDDLEBURG, PA.—Juniata Electric Company, Mifflin, has taken over the local plant of the Middleburg Electric Light, Heat & Power Company, and will be used as an extension to its system.

PHILADELPHIA, PA.—The city has passed an ordinance granting permission to the West Philadelphia Passenger Railway Company to construct a double-track extension to its tracks on Island Road and Eastwick avenue to the county line.

PHILADELPHIA, PA.—E. F. Henson & Company, 926 North Delaware avenue, have had plans prepared for the construction of an addition to their engine plant. Contract has been awarded to the William Steele & Sons Company, 32 South Fifteenth street.

PITTSBURGH, PA. — Heppenstall Forge & Knife Company, Forty-seventh and Hatfield streets, has awarded a contract to Roy C. Huntsman, Pittsburgh, for the construction of a boiler plant at its works to cost about $23,000.

ST. PETERSBURG, FLA.—St. Petersburg Lighting Company will enlarge its power plant.

COMMERCE, GA.—The city has authorized a bond issue for $15,000 to provide for the installation of an electric light and power plant. C. A. Goodin, clerk.

WAYCROSS, GA.—Five-Mile Lumber Company is in the market for 3000 feet of ½ inch wire cable.

NORTH CENTRAL STATES.

LIMA, OHIO.—The Lima Advertising Club is interested in installing a White Way through the city's business district. Address secretary of the board.

FRANKLIN, IND.—Franklin Water, Light & Power Company, which is controlled by the Interstate Public Service Company, has filed a petition with the Indiana Public Service Commission for an increase of 15 per cent in electric lighting rates. A valuation of the plant will be made by the Commission.

INDIANAPOLIS, IND.—The plan is being considered by Governor Goodrich and a committee of the legislature to erect one wing of a proposed building and power house for the Indiana University Medical College. The proposed building and powerhouse will cost, complete, $450,000 but it is proposed to expend $130,000 of the emergency and contingent fund for the immediate erection of the first wing.

INDIANAPOLIS, IND.—Merchants Heat & Light Company has increased its capital stock from $2,000,000 to $2,500,000.

JEFFERSONVILLE, IND.—Charlestown township has sold an issue of $36,000 4½ per cent bonds to be used in the erection of a new high school building, complete with electrical wiring and ventilating devices. Charles F. Pangburn, trustee, Charlestown, Ind. Bids opened May 11.

SOUTH BEND, IND.—Studebaker Corporation will expend $27,000 for installing electrical equipment in the forge department and machinery shops.

DATES AHEAD.

National Fire Protection Association. Annual meeting, Chicago, Ill., May 7-9. Secretary, Franklin H. Wentworth, 87 Milk street, Boston, Mass.

National Electrical Supply Jobbers' Association. Annual meeting, May 6, 7 and 8, Del Monte, Cal.

Pacific Coast Section of National Electric Light Association and California Association Electrical Contractors and Dealers. Joint convention, May 9, 10 and 11, Del Monte, Cal.

American Association of Engineers. Annual meeting, May 14, 1918. Secretary-Treasurer, A. H. Krom, 29 South La Salle street, Chicago.

Arkansas Association of Public Utility Operators. Annual convention, Arlington Hotel, Hot Springs, Ark., May 21-22-23. Secretary-Treasurer, R. B. Fowles, Pine Bluff, Ark.

Electrical Supply Jobbers' Association. Annual meeting, Homestead Hotel, Hot Springs, Va., May 21-22-23. Secretary, Franklin Overbagh, 411 South Clinton street, Chicago.

Electrical Contractors' Association of Georgia. Annual meeting, Tybee Island, Ga., June, 1918. Secretary, Dan Carey, 614 Chamber of Commerce building, Atlanta, Ga.

American Society of Mechanical Engineers. Spring meeting, Worcester, Mass., June 4-7. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

National Electric Light Association. Annual convention, Hotel Traymore, Atlantic City, N. J., June 13 and 14. Secretary, T. C. Martin, 33 W. 39th street, New York City.

Texas State Association of Electrical Contractors. Annual meeting, Galveston, Tex., June 15, 1918. Secretary, H. S. Ashley, Fort Worth, Tex.

Southeastern Section, National Electric Light Association. Annual meeting, June 19-20, 1918, Atianta, Ga. Secretary-Treasurer, T. W. Peters, Columbus, Ga.

American Institute of Chemical Engineers. Summer meeting, Berlin, N. H., June 19-22. Headquarters, Mt. Madison House, Gorham, N. H. Secretary, John C. Olsen, Brooklyn, N. Y.

American Institute of Electrical Engineers. Annual convention, Atlantic City, N. J., June 26-28. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 10-12. Secretary, D. L. Gaskill, Greenville, Ohio.

National Association of Electrical Contractors and Dealers. Annual convention, Cleveland, Ohio, July 17-20. Secretary, Harry C. Brown, 101 West 40th street, New York City.

Northwest Electric Light and Power Association; affiliated with N. E. L. A. Annual meeting, September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

ATHENS, ILL. — Athens Electric Light & Power Company has filed a petition with the Illinois Public Utilities Commission asking for permission to construct a high tension wire over the tracks of the Chicago, Peoria & St. Louis Railroad.

AURORA, ILL.—The park commissioners of Aurora are having plans prepared for street lighting.

DEKALB, ILL.—Swanson Brothers, electrical contractors of this city and Sycamore, have paid for a full page advertising space in the local papers of those cities during the Liberty Loan Campaign. The space carried well-written and well-edited comment, some of the prominent men of the nation being quoted.

DIXON, ILL.—Sterling, Dixon & Eastern Railway Company has applied to the Illinois Public Utilities Commission for a six-cent fare in both Sterling and Dixon, for a ten cent fare between Dixon and the State Epileptic Colony, and for a 30-cent fare between Sterling and Dixon, with transfer privileges in both cities.

DIXON, ILL.—The Illinois Public Utilities Commission has authorized the Dixon Telephone Company to increase rates as set forth in schedule filed with the commission, to become effective May 1, 1918.

EAST ST. LOUIS, ILL.—East St. Louis Light & Power Company and the Alton Gas & Electric Company have filed petitions with the Illinois Public Utilities Commission for an increase of from 10 to 15 per cent in power and lighting rates in East St. Louis, Alton and surrounding towns.

FAIRMONT, ILL.—Homer Electric Light & Power Company has been awarded the contract to furnish electric lights for Fairmont.

GALENA, ILL.—Pitcher Telephone Company has been given permission by the Illinois Public Utilities Commission to increase rates in Galena, East Dubuque, Stockton, Apple River, Scales Mound, Elizabeth and Hanover, with a slight reduction for rural telephones.

PECATONICA, ILL.—This town will install an automatic electric pump after July 1 and will give 24-hour service.

PONTIAC, ILL.—The petition of the Bloomington, Pontiac and Joliet Electric Railway Company for an increase in rates has been dismissed by the Illinois Public Utilities Commission.

JANESVILLE, WIS.—Rock County Board will install improved lighting system at the asylum and almshouse Address Supervisor Perrigo, chairman of special committee.

WAUPACA, WIS.—Plans are being prepared to rebuild the power dam. Address John McCall.

GUEYDAN, LA.—The sum of $10,000 have been voted in bonds for establishing a municipal light system. Address mayor.

OTTERVILLE, MO.—Jesse Straten has completed plans for the installation of the proposed electric light plant.

ST. LOUIS, MO.—A complete canvass was made of the employees of the United Railways Company of St. Louis in the interests of the Third Liberty Loan, the company allowing a committee of employees to work on company time to make the canvass. A total of $175,000 was sold, the bonds being taken by 3330 employees. Only three employees refused to subscribe for bonds and they were discharged from the service of the company.

OGALLALA, NEB.—Plans are being prepared to install additional street lighting. Address James H. Class, superintendent.

SOUTH CENTRAL STATES.

LITTLE ROCK, ARK.—Mutual Motors Company contemplates the installation of a complete new shop, new equipment including a lathe with 8-inch to 12-inch swing, 20-inch back-geared drill press, electrical equipment, portable crane, air compressor, etc.

NEW ORLEANS, LA.—The construction of an electric railway between New Orleans and Mobile, Ala., is under consideration.

STONEWALL, OKLA.—Oklahoma Power & Transmission Company contemplates the extension of its electric transmission lines to Stonewall to supply electrical service here.

HEADLAND, ALA.—Improvements and alterations will be made in the municipal electric light and power plant. A bond issue for $10,000 has been voted by the city officials for this purpose.

CARTHAGE, TEX.—Plans are being considered by F. T. Rembert and K. S. Melton of Longview for the installation of an electric light plant and ice factory in connection with the Carthage Cotton Oil Company plant.

DALLAS, TEX.—Transmission connection has just been made between the Dallas Power plant of the Dallas Light & Power Company and the Fort Worth power plant of the Texas Power & Light Company. This connection enables an exchange of power by the two systems and affords an auxiliary plant in case of breakdown of either of the plants.

FORT WORTH, TEX.—Dixie Girl Mining Company, with offices in the What building, will purchase electric equipment for developing lead and zinc mining near Buffalo.

WESTERN STATES.

OLYMPIA, WASH.—P. C. Kaylor has made application for 9000 second feet of water from the Spokane river for purposes of electrical development. The Western Washington Power Company has made application for permit to construct reservoir and store unappropriated waters of the Baker river, 30,000 acre feet for production of power, estimated cost of development $1,000,000.

SEATTLE, WASH.—A change may be made in the plan of the municipal elevated railway of the city. It is proposed to drop the road to the street level for three fourths of a mile on the tide flats, thereby causing a saving of some $10,000.

TACOMA, WASH.—The voters of this city voted down the proposition of bonding in the sum of $4,000,000 for construction of an electric power plant.

MARSHFIELD, ORE. — C. A. Smith Lumber Company is planning for the installation of a quantity of new electric equipment to double the present capacity of its mill. It is estimated that the new machinery will cost about $80,000.

PORTLAND, ORE.—The city council is considering a bond issue for $4,000,000 to provide for the purchase of a large tract of land as a site for the construction of a new power plant. An ordinance has been introduced to this effect.

ALPAUGH, CAL. — San Joaquin Light & Power Company has completed the construction of a local substation, which will be used for supplying power for the operation of the machinery used in irrigating 8000 acres of land in the Alpaugh irrigation district. Three 500-kilowatt transformers have been installed, the electricity being supplied from the Corcoran generating station.

FRESNO, CAL.—San Joaquin Light & Power Corporation has completed the work of tying in its power transmission lines with the Mount Whitney system, to provide for greater efficiency in handling the unusual load in a dry year. Fire recently destroyed the Copper Mine substation of the San Joaquin Company, with loss estimated at about $4000.

KNIGHTS FERRY, CAL.—Sierra & San Francisco Power Company, San Francisco, is planning the reopening of the old local power plant, closed down about twelve years ago. The Railroad Commission has made request to the company for the reopening of the plant, as it will result in a considerable saving in oil.

LONG BEACH, CAL.—Pacific Electric Company has commenced the construction of a substation at East Wilmington Junction to provide for increased capacity for the Long Beach, San Pedro and Los Angeles-San Pedro lines of the company.

LOS ANGELES, CAL.—The city council is planning for the installation of an electric lighting system in Fifty-fifth street, from Budlong to Normandie avenue. Marbelite lighting standards will be used.

LOS ANGELES, CAL.—An appropriation of $79,000 has been made for the proposed extensions in the municipal distribution system to all parts of the harbor section, including the extension of the power transmission lines of Fish Harbor on Terminal Island, the latter improvement to cost $34,000.

LOS ANGELES, CAL.—The city is negotiations with the Harbor Commission for the lease of property on the harbor boulevard, as a site for the construction of a new municipal substation to provide for the supplying of power in the West Basin and Wilmington districts.

LOS ANGELES, CAL. — Pacific Electric Railway Company has recently awarded a contract for the construction of a brick substation, about 35x45 feet in size, to be located in the Wilmington district. Houghton & Anderson, 143 Rose street, Los Angeles, are the contractors.

MODESTO, CAL.—Sierra & San Francisco Power Company is planning for extensive improvements in its system, including the construction of a hydro-electric plant on the Middle Fork of the Stanislaus river.

REDDING, CAL.—Fire recently destroyed the power plant, boiler house, and planing mill at the plant of the Shasta Land & Timber Company, with loss estimated at $50,000.

RIVERSIDE, CAL.—Southern Sierras Power Company has recently acquired the three-story reinforced-concrete building formerly occupied by the Riverside Abstract Company at 777 Eighth street, and is planning for alterations and improvements to utilize the structure as an office building.

RICHMOND, CAL.—The City Council has voted $12,000 for electrical equipment for the municipal wharf, now under construction. Contracts have been awarded for two electric trucks, at a cost of $4,383, to the United Vehicle Company and for a five-ton electric crane to the Cyclops Iron Company, at $7,500.

PROPOSALS

TRAVELING CRANE.—Bids will be received on May 6 for an electric traveling crane in the construction shop at Norfolk, Va., at an estimated cost of $8,500. Address chief of the Bureau of Yards and Docks, Navy Department, Washington, D. C.

GENERATOR, SWITCHBOARD PANEL, ETC.—Bids will be received on May 6 at Brooten, Minn., for the following equipment: One 25-horsepower, 2-cycle type fuel oil engine, one 15-kilowatt, 125 to 250-volt, 3-wire type belted generator, one endless double leather generator belt and one switchboard panel. Address W. J. Collins, village recorder.

INCORPORATIONS

INDIANAPOLIS, IND. — Timberlake-Machan Company has incorporated to buy, sell and repair electrical storage batteries with a capital of $25,000. The directors of the company are Stanley M. Timberlake, Robert R. Machan and William T. Brown.

NEW YORK, N. Y.—Ideal Electric Therapeutic Apparatus Corporation. Nominal capital, $5000. To manufacture electrical apparatus. Incorporators: A. and S. Cooper, and D. Hertman, 160 East Twenty-third street.

NEWARK, N. J.—Marvel Process Company. Capital, $125,000. To manufacture heating appliances. Incorporators: Walter E. Shettlemore, Elizabeth H. Shettlemore, and John Applebaum, Newark.

NIXON, TEX.—Nixon Electric Light & Power Company. Capital, $12,000. To operate a local plant. Incorporators: J. F. Wood, Jr., W. L. Hoover, and C. T. Morene, Nixon.

PITTSBURGH, PA.—Sperry & Bittner. Capital, $10,000. To engage in the manufacture of electrical machinery. William A. Bittner is treasurer.

NEW YORK, N. Y.—Vesuvius Heating Corporation. Capital, $30,000. To manufacture heating apparatus, etc. Incorporators: S. J. Mitchell, J. Lewis, and J. M. Ferris, Averne, L. I.

NEW YORK, N. Y.—W. & R. Manufacturing Company. Capital, $100,000. To engage in the manufacture of heating and lighting systems, and radiators. Incorporators: L. T. Fetzer, A. J. Lalibert, and H. MacIntyre, 220 West Forty-ninth street.

NIAGARA FALLS, N. Y.—Empire Power Corporation. Capital, $3,000,000. To operate a plant for the generation and distribution of electric energy. Incorporators: F. B. Baird, E. L. Koons, and M. S. Hall, Buffalo.

DOVER, DEL.—Tropical Electric Company. Capital, $100,000. To operate a plant for the generation and distribution of electricity. Incorporators: E. M. Haslam, Ferris Giles, and E. Lemon, Wilmington.

Trade Activities

Paragon Electric Company Engages Larger Quarters—Novel General Electric Exhibit—Valuable Catalogs Issued

Central Electric Company, 316-326 South Wells street, Chicago, is distributing to the trade a new edition of its discount and price list to apply on items listed in general catalog No. 39. The book has been revised to date and supersedes all previous issues. Owing to continuing fluctuation in prices, however, they are subject to change without notice.

Roller-Smith Company, 233 Broadway, New York City, has ready for distribution copies of bulletin No. 501. This describes the new type S. T. (Self-timing) circuit-breakers, which have been designed in a unique way to provide for both starting and running protection of motors in a single, automatic device. The bulletin describes how this is done and gives data on the various forms and sizes in which these breakers are built.

Paragon Electric Company, 9 South Clinton street, Chicago, has engaged larger and better quarters in the Old Colony Building, 37 Van Buren street, the present quarters having become inadequate for the proper handling of its business. The Paragon company is the manufacturer and sole proprietor of the Paragon line of ground cones, time switches, battery boxes and self-tying knobs, also ironite, rubber-insulated telephone dropwire. The Paragon ground cone has been found an excellent device for grounding lightning arresters of all kinds and insures a permanent and perfect ground when properly installed. It is claimed to be the only ground on the market for electric light, power, telephone, telegraph and trolley installations, designed along sound engineering lines, and has received the unqualified endorsement of engineers and contractors.

Electric Machinery Company, Minneapolis, Minn., recently issued Bulletin 183 entitled "Lower Pumping Costs with E-M Synchronous Motors," which covers a wide investigation made by the company on the electrical drive for large pumps. The bulletin demonstrates the performance of the synchronous motor in the pumping field and outlines the general subject of centrifugal pump development. The general design of pumps is described and the demands made upon them for different types of work and the performance of the pumps in meeting these requirements are dealt with at some length. A number of points entering into consideration in a motor for driving pumps are presented, the most important of which are the starting characteristics, efficiency, power factor, load factor of the pumping plant and reliability of service. The bulletin is well illustrated, contains valuable pump data and sums up the many advantages of E-M synchronous motors for driving centrifugal pumps.

Landers, Frary & Clark, electrical appliance and hardware manufacturers, New Britain, Conn., have purchased the business of the National Electric Utilities Company, New York City. The new owners plan to increase and develop this new business which they have taken over.

Beardslee Chandelier Manufacturing Company, 216 South Jefferson street, Chicago, recently issued a new booklet descriptive of the Denzar unit of lighting. The Denzar will appeal to the business man especially as it redistributes the rays of light and effects an intensity well suited for the work, regardless of what it may be. It is furnished in a variety of styles and sizes, in both plain and ornamental designs, and is adaptable to a wide range of heights and spacings. The Denzar is claimed to improve working conditions, speed production, reduce accident hazard and increase sales possibilities by the proper display of merchandise and other commodities.

General Electric Company, at the annual meeting of the National Railway Appliance Association held in Chicago last month, displayed its large service flag and was one of the most novel exhibits presented. Due to war conditions, making shipments for exhibits all but impossible, the General Electric Company was unable to install its usual representative exhibit for this occasion. The best answer to the question as why the company's railway appliances were not on exhibit, was its large service flag, flying from a flagstaff in the space reserved by the company, and bore 3650 stars, representing that number of its employees in army and navy service.

Permutit Company, 440 Fourth avenue, New York City, announces the recent appointment of Albert Tate Smith, formerly connected with the company, to the position of assistant manager of sales. Mr. Smith was lately manager of the R. U. V. Company, 50 Broad street, New York City. He is widely known in the water purification field, and his many friends will be glad to learn of his important position with the progressive Permutit selling organization, which is rapidly extending its activities in many fields.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing Catalog 1-A, dated February, 1918, and supersedes Catalog 1-A, dated May, 1916, dealing with Westinghouse lightning arresters. Some very interesting facts about lighting are presented and the use of arresters to take of atmospheric lighting is well described. An extensive line of arresters is shown and among the features possessed by the arresters are: A variety designed to meet all requirements; resistances where used at lowest value compatible with protection of the arrester from destruction; equivalent spark-gap of each arrester lowest possible for the type of service for which the arrester is listed; resistance of a new and superior material; all arresters arranged for easy and safe inspection; all parts easily renewed when necessary and at low cost; outdoor arresters entirely rainproof, although easy of access. All types are illustrated and described in detail, and diagrams showing approximate dimensions of the various styles offered are contained in the catalog.

Novel Exhibit of General Electric Company.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

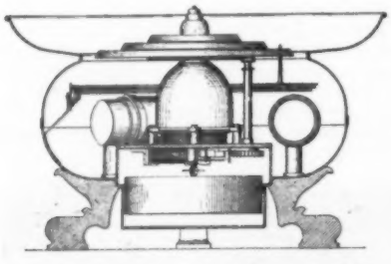
A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Lamp-Bulb Coloring (1,259,505).—To make a permanent colored coating, Cyril E. Franche (a varnish maker at 440 Orleans street, Chicago) mixes seven pints of oil varnish with one pint of a thinning agent and a small quantity of a coloring agent containing a pigment.

Phase Distribution for Electric Furnaces (1,260,298).—In using three-phase current according to this patent, Thaddeus F. Baily and Frank T. Cope (both of Alliance, Ohio) connect two phases to a heating or high-temperature furnace, and connect the third phase to a low-temperature or reheating furnace, both furnaces being of the resistance type. The patent was assigned to the Electric Furnace Co., of Alliance.

Tungsten Sintering Furnace (1,260,940).—Carbonized tungsten electrodes, water cooling for the electrodes, and means of maintaining a constant pressure of the electrodes against the ingot are recited in this patent to Carl A. Pfanstiehl, of North Chicago, Ill.

Illuminated Fountain (1,255,711).—In this patent, Newton Crane, of Boston, Mass., discloses a motor-driven mechanism which admits the water intermittently to the jets and which rotates several sets of colored screens. These screens move at different



No. 1,255,711—Illuminated Fountain.

speeds and one of them may be moved by the water, thereby continually changing the colors superposed on the water. The fountain described is of a size suitable for use as a table ornament and as a humidifier for indoor air.

Porous Filling for Battery Grids (1,260,472).—In this storage-battery grid, the active material is held in the pores of a filling for the grid. This filling is described as a "phenolic condensation product," a term suggesting what is commonly known on the market as Bakelite. The patent was assigned by Thomas Spencer, of Philadelphia, to the National Carbon Co., of Cleveland.

Cheap Lamp Sockets (1,260,400 and 1,260,401).—Two types of cheaply constructed sockets, particularly designed for automobile lamps, are shown in these two patents to George C. Knauff of Chicago. In one case, he

No. 1,260,400.—Simple Automobile Lamp Socket.

uses a zigzag form of conductor both as a wire terminal and as a mounting for the spring-pressed central plunger of the socket. In the other, he uses a still more simple construction, depending on a ground return to the casing of the socket for the other connection.

Cable Hanger (1,260,695).—For adjustable cable supports, Charles Masson, of Montreal, Quebec, first provides a vertical plate, such as the web of an angle beam, with downwardly curved notches in this web. Then he uses this web as a support for cable brackets, each of which straddles the web and has a pin resting in one of the notches.

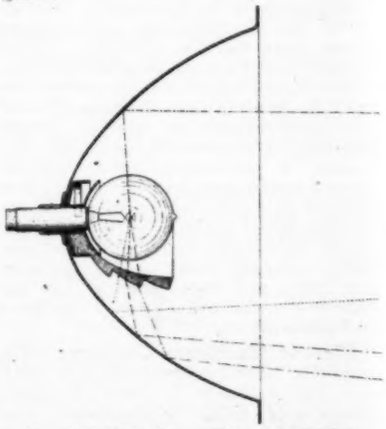
Battery-Charging System (1,260,648).—To reduce the voltage of a battery-charging generator when the battery is charged to a predetermined degree, Frank J. Conrad, of Pittsburgh (according to this patent, which is assigned to the Westinghouse Electric & Mfg. Co.), uses a pair of opposing coils so constructed that the same temperature variation acts at different rates on the two coils.

Wire Terminal (1,258,657). — According to this patent, issued to a well known Chicago manufacturer of panelboards and the like, John Cuthbert provides a wire coiling and binding clamp, using a screw with an offset head which engages the wire and with a sort of hook formation on the head for coiling the wire under the head.

No. 1,258,657.—Wire Terminal.

Arc Welding or Brazing (1,260,875 and 1,260,989).—To prevent oxidizing and burning the metal when using an electric arc for brazing operations, George W. Cravens, of Westfield, N. J., incloses the arc in an insulating and nonoxidizing vapor. For this purpose, he may use a brazing electrode having a tubular shell around it which is adapted to produce such a vapor when subjected to the heat of the arc. Both patents were assigned to the C. & C. Electric & Mfg. Co., of Garwood, N. J.

Light-Projecting Lamp (1,257,405).—Instead of leaving the downward rays of an automobile headlight free to be projected at upward angles by a parabolic reflector, John E. Ryan of Boston, refracts these rays by a refractor which surrounds only the lower half of the lamp, thus avoiding glare.



No. 1,257,405—Glare-Free Headlight.

Condenser-Winding Apparatus (1,260,819).—By connecting a short-circuit indicating mechanism to the bands of foil which are being wound in coil form with a dielectric between them, Wolfgang E. Schwarzmann, of Long Meadow, Mass., and Charles M. Wild, of Springfield, Mass., guard against defects in the insulating. The patent was assigned to the Bosch Magneto Co. of New York City.

Contact Shoe for Electric Railways (1,261,578).—Instead of depending entirely on the conductivity of the wear-resisting face of a shoe for third-rail systems, William W. Macfarlane, of Philadelphia, perforates this face and fills the openings with conducting material, so that these high-conductivity fillings also contact with the rail.

Men in Service

J. M. Eckert Enters Ordnance Dept.—Lieut. W. S. Tucker Awarded French War Cross—Robbins & Meyers Service Flag

CYRIL CONNOLLY, formerly connected with the engineering department of the De La Vergue Machine Company, New York City, recently joined the navy.

TRACY LYNN, chief clerk in the office of the Illinois Traction System, Springfield, Ill., has gone to Camp Wright, Me., to enter military service. His office associates in Springfield presented him with a gold Shrine ring.

J. B. WHITEHEAD, professor of electrical engineering in the department of engineering, Johns Hopkins University, of Baltimore, Md., has been commissioned a major in the Engineers, U. S. R. and detailed to the Naval Consulting Board.

ARTHUR L. MULLERGREN, secretary-treasurer of the Benham Engineering Company, consulting engineers, Oklahoma City, Okla., has been commissioned a first lieutenant in the Quartermasters Corps. He has been assigned for duty as an officer in charge of light, power and ice, camp utilities commission, Camp Funston, Kans.

JOHN M. ECKERT, assistant engineer in the gas and oils department of the Underwriters' Laboratories, has entered the Ordnance Department. He will act as supervisor of tests at steel plants in the vicinity of Chicago, and also in Ohio, Indiana, Wisconsin and adjoining states. Physical tests, chemical analysis, heat treatment at plants and the instruction of inspectors for this territory will be under the direction of Mr. Eckert.

UNIVERSITY OF ILLINOIS, Urbana, Ill., has lost the following members of its senior class of electrical engineering students through enlistment in government service: R. A. Burtnett, W. E. Bull, Glenn Koehler, O. G. Tinkey, W. S. Slack, R. K. Newton, R. J. Craigmile, G. H. Haldeman, E. McEvers and L. M. Turner. In addition to these seniors, E. R. Devol and W. T. Stevens, junior students, have recently withdrawn for military service.

ROBBINS & MYERS COMPANY, with main offices and factory at Springfield, Ohio, in the April 15 number of the R. & M. Co-operator publishes a supplementary honor roll, containing the following names: Peter Staff, Burnell Miller, Frank Schafer, A. Richmonds, J. H. Dietz, Alvin Felker, Emery King, C. H. Griest, E. W. Southmayd, Harry E. Dinterman, Oscar Stockstill, Vernie Atchison, Willard Silivan, Arthur Zeller, Charles Bristow and George C. Hooms. A service flag was recently unfurled by the R. & M. company in honor of its men who have left Plant 2 to serve their country. The flag bore 72 stars when first unfurled but since that time a number of stars have been added.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

LIEUT. WILLIAM SIKES TUCKER, who will be remembered for his athletic activities while a student of the University of Pennsylvania and who is now serving with the American Expeditionary Forces in France, has been awarded the French War Cross for bravery. This information was recently cabled to his

Lieut. William S. Tucker.

parents at Mobile, Ala. No details regarding the particular feat for which the former Pennsylvania man was rewarded have as yet been received. He is attached to the headquarters company, One Hundred and Second Infantry, A. E. F., and has been in France for about nine months. Previous to joining the American Expeditionary Forces, Lieutenant Tucker was connected with the sales department of the Electric Storage Battery Company, Philadelphia, Pa.

EDWARD A. HANNAN, formerly connected with the accounting department of the Duquesne Light Company, Pittsburgh, Pa., is now in the service of Uncle Sam on detail duty at the Curtiss Airplane plant, Buffalo, New York.

DAVY GAYDON, formerly in the employ of the Southern California Edison Company at Pomona, Cal., was recently appointed a sergeant in the Ordnance Department, and is now stationed at Camp Pike, Little Rock, Ark.

BERTRAM C. RODGERS, formerly in the engineering department of the Duquesne Light Company at Boston, has joined the non-flying division of the Aviation Corps. He recently left for Texas where he will take up the study of the airplane in general, after which he expects to take the examinations for entrance in the flying corps.

JOHNS HOPKINS UNIVERSITY, Baltimore, Md., carries the following names of electrical engineering students enlisted in various branches of government service: H. S. Baker, H. W. Ewald, E. G. Hall, G. S. Harris, D. H. Johnston, A. B. Junkins, R. E. Martz, E. E. Perkins, Milton Reiner, Abraham Tobias, J. G. Webster, C. H. Willis, B. S. Winchester and L. M. Young.

NORTHWESTERN UNIVERSITY has added the fifth gold star to its service flag of 1124 stars, in honor of the fifth of her boys who has sacrificed his life for the nation. It is for Clarence Kranebell, an electrical engineering student of last year, who enlisted in the aviation corps, and died recently of spinal meningitis at Kelly Field, San Antonio, Tex. He had completed a four years' course on the Northwestern campus before enlisting.

UNIVERSITY OF ARKANSAS, Fayetteville, Ark., includes in its roll of honor the following names of electrical engineering students who have answered the call and are now serving with the colors: L. R. Cole, R. A. Lea, Lee H. Rogers, G. W. Watkins, A. J. Collins, J. E. Bell, James A. Dinwiddie, Alpha L. Goss, P. X. Rice, Frank D. Pape, Robert Dortch, Floyd Cal, H. F. Pendleton, J. B. Milbourne, W. P. Warner, J. P. Randolph, Ralph Hirsh, A. J. Collins, A. N. Thomas, L. C. Parsons, M. B. Coker, Lloyd Oneal, Lee Martin, W. H. Wolf, W. M. Brewer, C. U. Brewer, R. M. Cherry, W. L. Childers, J. C. Douthit, D. A. Locke, Louis Lighton, N. F. Moore, James T. McAteer, C. T. Meadows, W. E. Nelson, H. E. Perkins, H. H. Robison, Ed Smith, S. B. Scott, W. L. Teague, W. D. Henderson, J. P. Sparks, George F. Moore, Paul Martin, Levi C. Starbird, Klyce Fuzzelle and John S. Lipscomb.

These Loyal Americans Deserve Your Support—Buy a Bond

Personal

Kurt R. Sternberg Resigns—W. W. Erwin Promoted—C. O. Murphy Joins Merchants Heat & Light—Other Changes

O. E. HINES, formerly new business manager of the Washington Gas & Electric Company, Washington, Ohio, has become manager of the Boonville Light, Heat & Power Company, Boonville, Mo., succeeding C. B. Owens, resigned.

D. LYNN PLANTZ, manager of the Northwest Electric & Water Company, Montesano, Wash., a subsidiary of Marshall & Company of Boston, has resigned to become assistant treasurer of the Pacific States Electric Company, Seattle, Wash. He is succeeded by C. P. Kinkaid of Stanwood, Wash.

WILLIAM M. DYATT was recently appointed general manager of the Harwood Electric Company, Lehigh Navigation Electric Company and the Hazleton Steam Heat Company, Philadelphia, Pa., to succeed John S. Wise, recently promoted to the management of the big electric merger of companies throughout eastern Pennsylvania, with headquarters at Allentown.

W. RUSSELL PATTON, of the Globe Electric Company, Milwaukee, Wis., was married on April 6 to Miss Marguerite E. Houart. Mr. Patton is well known in the electrical industry in the Middle West, having been connected for a number of years with the Wagner Electric & Manufacturing Company of Chicago. He was later appointed district manager at Milwaukee, and left this position to establish the Globe Electric Company.

ROBERT J. NICKLES, head of the Nickles Electrical Company, Madison, Wis., is state chairman of Wisconsin State Association of Electrical Contractors and Dealers. This recognition was accorded him last year when the former state association was reorganized under the Goodwin Plan. Mr. Nickles is one of the leaders in the association, and believes in its aims and purposes. His company makes a specialty of the heavier line of electrical construction, and has been handling some of the larger contracts in Madison, included in which were several shop and factory installations.

CHARLES O. MURPHY has been appointed vice-president and general manager of the Merchants Heat & Light Company, Indianapolis, Ind., and has assumed his duties there. He succeeds George W. Hubley, chief engineer and general manager of the company, who has resigned and gone to Philadelphia. Mr. Murphy was born in Dublin, Ireland, and came to the United States as a young man. He is a graduate of St. Francis Xavier's college, New York City. In 1902 he went to San Francisco and organized the first steam heating company established in that city. As a result of the merger of five large public utility companies there in 1915 he became vice-president and general manager of the Consumers Light & Power Company.

LOUIS H. MATHER has become superintendent of distribution for the gas and electrical department of Norwich, Conn.

MORSE W. REW recently resigned as chief engineer of the Pittsburgh Transit Commission to become an assistant to A. M. Taylor who directs the passenger transportation of the Emergency Fleet Corporation.

W. W. ERWIN, who has been connected with the New York Edison Company for a number of years, was recently appointed chief operating engineer to succeed the late John P. Sparrow. Mr. Erwin joined the forces of

W. W. Erwin.

the Edison company in October, 1900 as a mechanical draftsman. In 1903 he was chief draftsman and three years later became superintendent of construction, which position he held until his recent appointment to the office of chief operating engineer.

TOWNSEND H. SOREN, assistant to the vice-president of the Hartford Electric Light Company, Hartford, Conn., was recently elected a vice-president of the company in charge of construction. He was born in Boston and received his education at the Boston Latin School and Harvard University, and graduated from the latter institution in 1893 with the degree of A. B. Immediately after his graduation he entered the employ of the General Electric Company at Schenectady, N. Y., with whom he remained until July, 1916, when he left to accept the position of assistant to the vice-president of the Hartford Electric Light Company. During the 18 years' association with the General Electric Company, Mr. Soren confined his activities largely to the general supervision of the work of that company in connection with large electric railway developments in New York City.

B. C. RILEY recently resigned as production manager of the Boston branch office of the Robbins & Myers Company to become associated with the Scoville-Wellington Company, a New York concern.

HARRY STRAPP, a load despatcher for the Edison Electric Illuminating Company of Boston, Mass., has severed his connection with that concern to become superintendent of the Towns Electric Light Company, Harbor Grace, Newfoundland.

H. A. LANGSTAFF, who has been associated with Willis L. Adams as an electrical engineer for the past two years, has resigned to become field electrical engineer for the J. G. White Engineering Corporation at Muscle Shoals, Ala., at the United States Government nitrate plant No. 2.

A. R. MANLEY, district manager of the Wisconsin-Minnesota Light & Power Company, Eau Claire, Wis., since that corporation took over the Chippewa Valley Public Utilities has tendered his resignation, effective May 1. Mr. Manley will engage in the general brokerage business, specializing in investment securities.

W. B. COLLINS, district manager of the water and light plants of Marshall & Company in southwestern Washington, with headquarters at Montesano, has become manager of a group of plants and consulting engineer in the matter of purchasing properties at the Boston office. F. B. Nims, who is northwestern manager for the company with offices at Seattle, will also assume the duties heretofore performed by Mr. Collins.

KURT R. STERNBERG, after an association with the Dickinson Manufacturing Company, Springfield, Mass., extending over a period of 12 years, has resigned to take up work as a consulting chemist. He will specialize in molded electrical insulations, hot and cold pressings, and heat, mechanical, electrical, oil, acid and water resistance tests, also advisory work. Mr. Sternberg has for many years devoted much time and effort to the development of fireat-proof electrical molded insulations and may well be called the pioneer in this field of work. While high grade heat-resistance materials were still in use, in 1908 he started to make Sternoid, a material that withstood from 400 to 500 degrees Fahrenheit. It has been found to possess even greater heat-resisting qualities than materials produced during more recent years, which resisted only 300 and 350 degrees Fahrenheit. Mr. Sternberg is at present installing a number of new processes at firms making electrical insulations. Though German born, he is a loval American citizen and an ardent patriot. He is widely affiliated with electrical and fraternal organizations and has played a prominent part in the civic affairs of Springfield.

Financial News

"Cost Plus" Plan for Utility.

In discussing the problems now confronting public utilities, one of the daily papers makes the following statements:

"As the cost of labor and supplies advance steadily, reducing the profits of electric roads and other utilities an increase in receipts becomes necessary. The only alternative is bankruptcy and in most cases that would merely postpone the inevitable increase in rates. Naturally investors are demanding an increase while patrons are objecting to paying higher fares.

"As a way of turning the difficulty several state commissions are proposing a 'cost plus' plan of operation, and investors grasp at the idea as a drowning man at straws. It seems to offer a refuge from the present menace to investments, but it may be asked whether the refuge would be secure.

"It is said in favor of the plan that it would check unreasonable demands by the public for costly improvements in service and would tend to reduce awards made by juries in damage suits. The objection is that all incentive to the exercise of ingenuity on the part of operating official and directors would be removed. They would grant almost any demand made of them with the inevitable result that operating costs would increase faster than ever. As a small profit would be assured no matter how extravagantly the property was operated and as no amount of care and economy could increase that profit why use care and economy?

"The 'cost plus' system may be desirable in an emergency, but for permanent use it is economically vicious and would almost certainly lead to bad results for security holders."

Outlook for Investments.

We are all now engaged in the Third Liberty Bond campaign, but when that has been brought to a successful conclusion, we will return to our regular lines of business. There are indications of a brightening outlook in the investment field. The prices of good investment securities have reached a level where investors can not afford not to buy. High-grade bonds are selling on a 6 per cent basis and above, and good short-term securities may be purchased on an 8 per cent yield. This statement was recently made by Henry L. Doherty. The investor who fails to take advantage of the present prices of high-grade securities, he points out, is missing an opportunity that comes but once in a lifetime.

"So far the demand has been largely for short-term securities," he says, "because they may temporarily return a higher yield than the long-term bonds. While in some instances there may be an advantage in purchasing short-term securities, the ordinary investor, in our opinion, should now purchase good long-term bonds, or if not bonds, then good preferred stocks. Attractive as present prices make the yield on short-term securities, the investor who purchases them and passes by long-term bonds now available on the market is, in our opinion, very much like the man who would take a position for the duration of the war at a higher salary and in doing so would sacrifice a good permanent situation."

Financial Aid for Utilities Needed.

Samuel Insull, president of the Commonwealth Edison Company of Chicago and chairman of the Illinois State Council of Defense, has given a statement of interest to the public in reference to the financial condition of many large utilities during the present era of practically stationary receipts and ever increasing costs of operation. Mr. Insull states that many of the utility companies are facing a crisis and that relief must come in the form in the way of higher revenue or a fixed basis of supplies. One large utility, in which Mr. Insull is not personally interested, he declares to be in a perilous position on account of the ever widening breach between operating revenue and operating expenses.

Receivers Appointed for Pittsburgh Company.

J. D. Callery, H. S. A. Steart and Charles A. Fagan, all of Pittsburgh, Pa., have been appointed receivers for the Pittsburgh Railways Company by the Federal Court. Mr. Callery is chairman of the railways directorate. This company is a subsidiary of the Philadelphia Railways Company, and operates about 600 miles of traction lines in the Pittsburgh district.

$517,026,000 U. S. Notes Sold.

The $500,000,000 block of certificates of indebtedness dated April 22 was oversubscribed $17,026,000, the treasury announced recently. The Boston, New York, Chicago, St. Louis and Minneapolis districts exceeded their tentative quotas. This is the last issue of certificates in preparation for receipts from the Third Liberty Loan.

Subscriptions by districts were as follows:

Boston, $36,468,000; New York, $222,486,000; Philadelphia, $35,0000,000; Cleveland, $39,133,500; Richmond, $11,097,000; Atlanta, $11,209,000; Chicago, $63,212,000; St. Louis, $25,698,500; Minneapolis, $15,000,000; Kansas City, $20,260,500; Dallas, $13,162,500; San Francisco, $23,540,000; treasury, $1,559,000.

New Financing of American Telephone & Telegraph.

An announcement has been made by the American Telephone & Telegraph Company to the effect that the New York Telephone Company, a subsidiary, has applied to the New York Public Service Commission for authority to issue $25,000,000 additional stock. Although the purpose of the issue is to reimburse the parent company for advances already made, the new issue calls attention to the large financial requirements of the Bell system and to the increasing obligations of subsidiary concerns. The sum of $118,000,000 was spent for improvements and extensions of the Bell properties in the single year 1917, and American Telephone continues to expand its facilities without stint as required to meet the nation's war demands.

Financial Status of Westinghouse, Church, Kerr & Company.

A statement of its financial condition for the year ended December 31, 1917, has been issued by Westinghouse, Church, Kerr & Company, and shows the net profit for the twelve months' period to be $1,005,353, after all charges, including $275,000 reserve for federal and state taxes. Dividends on the preferred stock amounted to $192,000, and on the common stock $200,000 was paid. Profit and loss surplus as of December 31 aggregated $1,561,634.

The balance sheet of Westinghouse, Church, Kerr & Company as of December 31, 1917, shows the following assets and liabilities:

ASSETS.

Investments in stocks and bonds	$ 1,966,041
Government and short-term securities	905,563
Notes receivable	135,000
Accounts receivable	2,381,361
Cash	369,514
Contract investment and construction advances	1,480,123
Furniture and fixtures	83,975
Discount on securities issued	1,965,740
Good will	2,000,000
Total	$11,287,317

LIABILITIES.

Preferred stock	$ 3,200,000
Common stock	4,000,000
Six per cent redeemable gold bonds	2,900
Notes payable	1,125,000
Accounts payable	1,122,783
Reserve for taxes and legal expenses	275,000
Surplus	1,561,634
Total	$11,287,317

Commonwealth Power Bonds Withheld.

President A. G. Hodenpyl of the Commonwealth Power, Railway & Light Company has sent a circular to holders of the 6 per cent convertible bonds maturing May 1, stating the company has filed an application with the war finance corporation for an advance to meet the payment of these bonds, but that it is impossible that action can be had thereon prior to May 1. Holders of the bonds are requested to withhold presentation of their bonds for payment until after the war finance corporation has acted upon the company's request.

Philadelphia Company Plans Note Issue.

The Philadelphia Company has under consideration plans for issuing $10,000,000 notes to provide new capital in financing extensions. According to present arrangements, there will be an issue of Duquesne Light Company notes, a subsidiary, probably running for one year and bearing 6 per cent interest. It is understood that Harris, Forbes & Company of New York will act as the underwriters. Proceeds derived from this issue will provide sufficient funds for the Duquesne to liquidate some of its debt to the Philadelphia Company, and at the same time provide additional working funds.

March Earnings of Commonwealth Power Show Improvement.

March earnings of the Commonwealth Power Railway & Light Company show great improvement over January and February. While gross earnings show only a comparatively small increase, there is a surplus after charges of $90,952, as against a deficit of $14,144 after payment of fixed charges the preceding month. Dividends on the preferred stock totaling $89,765 were earned, after payment of which there was available for common of $1,187 as compared with a deficit of $103,909 in February. Additional water power plant put into operation materially assisted in making for better earnings for the month. Officials report that railway operation is now normal and some increases in rates will soon be put into effect which should make for further improvement in earnings figures.

Earnings of the company and its subsidiaries for the month of March, compared with the previous month, are as follows:

	March, 1918.	Feb., 1918.
Gross earnings	$1,756,687	$1,619,201
Net earnings	691,706	570,060
Surplus after charges.	90,952	*14,144

*Deficit.

Dividends.

Columbia Gas & Electric Company has declared a quarterly dividend of 1 per cent, payable May 15 to stockholders of record April 30.

Mobile Electric Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable May 15 to stock of record April 30.

Greene Cananea Copper Company has declared a quarterly dividend of $2 a share, the same as three months ago, payable May 27 to stock of record May 10.

Colorado Gas & Electric Company has declared a quarterly dividend of 1 per cent, payable May 15 to stock of record April 30.

Connecticut Railway & Lighting Company has declared a quarterly dividend of 1¼ per cent on common stock, also a dividend of 1¾ per cent on preferred stock, both payable May 16 to stock of record April 30.

Southern California Edison Company has declared a quarterly dividend of $1.75 a share on common stock, payable May 15 to stock of record April 30.

Earnings.

EAST ST. LOUIS & SUBURBAN COMPANY.

	1918.	1917.
February gross	$ 311,063	$ 268,158
Net	86,071	95,865
Interest, etc.	66,648	63,969
Surplus	19,423	31,896
12 months' gross	3,742,457	3,131,624
Net	1,140,030	1,218,444
Interest, etc.	789,726	759,411
Preferred stock dividend	180,000	180,000
Balance	170,304	279,033

BANGOR RAILWAY & ELECTRIC COMPANY.

	1918.	1917.
February gross	$ 67,485	$ 68,776
Net	15,992	28,255
Interest, etc.	19,942	18,933
Surplus	*3,950	9,322
12 months' gross	887,921	844,757
Net	367,639	369,280
Interest, etc.	230,385	217,077
Preferred stock dividend	105,000	105,000
Balance	32,254	47,203

*Deficit.

Note—Extraordinary weather in February caused heavy losses of railroad revenues and increases of expenses.

UTAH SECURITIES CORPORATION.

The properties now controlled by the Utah Securities Corporation, inter-company charges eliminated, report for March:

	1918.
Gross earnings	$ 571,237
Net earnings	317,109
Twelve months—	
Gross earnings	6,811,904
Net earnings	3,634,241

AMERICAN POWER & LIGHT COMPANY.

Income account of the American Power & Light Company, for year ended December 31, 1917, compares as follows:

	1917.	1916.
Gross earnings	$1,622,177	$1,236,757
Net earnings	1,203,950	930,076
Surplus after charges	558,329	557,840
Sub-company net surplus	43,688	188,811
Total	*$602,017	$746,651
Preferred dividends	216,971	213,792
Common dividends	336,827	328,216
Balance	$48,219	$204,643

*After preferred dividends, balance was equal to $4.42 a share on 87,054 shares of common stock outstanding, against $6.49 earned in 1916 on 82,054 shares.

LAKE SHORE ELECTRIC RAILWAY SYSTEM.

	1918.	1917.
February gross	$141,162	$118,242
Net after taxes	29,792	31,053
Deficit after charges	6,505	3,329
2 months' gross	282,717	247,848
Net after taxes	56,089	64,632
Deficit after charges	16,384	4,124

CONSUMERS POWER COMPANY.

Gross earnings for March, $508,077; net, $287,496; surplus after charges, $136,839. For 12 months: Gross, $5,885,743; net, $2,876,061; surplus after charges, $1,389,981.

PACIFIC GAS & ELECTRIC COMPANY.

For March—	1918.	1917.
Gross operating revenues	$ 1,716,652	$ 1,581,484
Net earnings	612,463	588,106
Total net income	644,110	614,835
Surplus after dividends	161,999	133,664
For 12 months ended March 31—		
Gross operating revenues	20,216,594	18,718,453
Net earnings	6,970,753	7,553,469
Total net income	7,499,300	8,009,261
Surplus after dividends	1,691,012	2,563,161

PHILADELPHIA COMPANY.

Philadelphia Company and affiliated operating companies make the following statement, classified by departments, for the month of February, 1918, and the 11 months ended February 28, 1918:

Natural Gas Department—	
February gross earnings	$ 1,086,216
Net earnings after taxes	512,327
11 months' gross earnings	9,470,418
Net earnings after taxes	4,482,154
Oil Department—	
February gross earnings	63,293
Net earnings after taxes	37,545
11 months' gross earnings	718,532
Net earnings after taxes	492,676
Coal Department—	
February gross earnings	123,609
Net earnings after taxes	4,247
11 months' gross earnings	1,549,770
Net earnings after taxes	650,553
Electric Light & Power Department—	
February gross earnings	913,435
Net earnings after taxes	263,967
11 months' gross earnings	8,943,988
Net earnings after taxes	2,426,594
Street Railway Department—	
February gross earnings	967,925
Net earnings after taxes	40,450
11 months' gross earnings	12,713,341
Net earnings after taxes	2,986,912

NORTHERN STATES POWER COMPANY.

Increased gross and net earnings are reported by the Northern States Power Company for the year ended December 31, 1917, but enlarged interest and discount charges left a smaller balance available for dividends, as compared with 1916. The income account, with comparison, is appended:

	1917.	1916.
Gross earnings	$7,154,508	$6,087,153
Net earnings	3,389,780	3,341,657
Interest charges	1,709,837	1,593,128
Amortization of debt discount and expense	140,000	.....
Preferred dividends	916,011	740,236
Common dividends	*188,931	283,813
Surplus for year	435,000	724,479

*Besides this sum $240,970 in common dividends was charged to surplus of previous periods.

INTERBOROUGH RAPID TRANSIT COMPANY.

For March net income was $713,525, against $897,838 for March a year ago. Nine months' net income was $5,601,780, against $6,740,664 for the same period a year ago.

GENERAL GAS & ELECTRIC COMPANY.

(Subsidiaries.)

A comparative statement of estimated gross revenue for March, 1918, and March, 1917, follows:

	1918.	1917.
Rutland System	$ 39,668.70	$ 36,331.09
Northwestern Ohio System	25,000.00	19,721.79
Sandusky System	40,621.15	44,340.04
Binghamton System	33,360.45	27,897.78
Sayre System	11,272.00	8,362.86
New Jersey System	21,199.09	16,668.41
Interurban Gas Company	660.20	548.86
Total	$171,781.59	$153,870.83

REPUBLIC RAILWAY & LIGHT COMPANY.

Income account of the Republic Railway & Light Company and subsidiaries for the year ended December 31, 1917, compares as follows:

	1917.	1916.
Gross earnings	$4,889,916	$3,987,617
Net after taxes	1,548,732	1,660,209
Other income	67,206	20,966
Total income	$1,615,938	$1,681,176
Int. and sub. Co. divs.	1,004,427	827,569
Net income	611,511	853,606
Preferred dividends	311,484	311,484
Surplus	$ 300,027	$ 542,122

GALVESTON-HOUSTON ELECTRIC COMPANY.

	1918.	1917.
February gross	$ 181,822	$ 148,284
Net after taxes	56,208	43,314
Surplus after charges	17,231	6,554
12 months' gross	2,152,766	1,953,997
Net after taxes	727,554	705,247
Surplus after charges	272,085	265,792

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Apr. 23.	Bid Apr. 30.
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	70	70
American Gas & Electric of New York, common	10+extra	86	88
American Gas & Electric of New York, preferred	6	38	40
American Light & Traction of New York, common	..	195	196
American Light & Traction of New York, preferred	6	94	94½
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	70	70
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	..	..
American Telephone & Telegraph of New York	..	100	97½
American Water Works & Elec. of New York, common	..	4¾	5
American Water Works & Elec. of New York, particip	7	13	13
American Water Works & Elec. of New York, first preferred	..	57½	57½
Appalachian Power of Bluefield, common	..	2¼	2¼
Appalachian Power of Bluefield, preferred	7	20	20
Cities Service of New York, common	+extra	201	200
Cities Service of New York, preferred	6	74¼	74¼
Commonwealth Edison of Chicago	8	103	104
Comm. Power, Railway & Light of Jackson, common	..	22	21
Comm. Power, Railway & Light of Jackson, preferred	6	46½	44
Federal Light & Traction of New York, common	..	5½	6½
Federal Light & Traction of New York, preferred	..	28½	29½
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	25	25
Middle West Utilities of Chicago, preferred	8	57	57
Northern States Power of Chicago, common	ex. div. 7	40	40
Northern States Power of Chicago, preferred	ex. div. 7	84	84
Pacific Gas & Electric of San Francisco, common	..	30½	32
Pacific Gas & Electric of San Francisco, preferred	6	..	81½
Public Service of Northern Illinois, Chicago, common	7	74	74
Public Service of Northern Illinois, Chicago, preferred	6	82	82
Republic Railway & Light of Youngstown, common	4	22¼	22¼
Republic Railway & Light of Youngstown, preferred	6	56	56½
Standard Gas & Electric of Chicago, common	..	4	4½
Standard Gas & Electric of Chicago, preferred	6	23	24
Tennessee Railway, Light & Power of Chattanooga, common	..	2¼	2¼
Tennessee Railway, Light & Power of Chattanooga, preferred	6	8	9¾
United Light & Railways of Grand Rapids, common	4	27	27
United Light & Railways of Grand Rapids, preferred	6	58	58
Western Power of San Francisco, common	..	13¼	13½
Western Power of San Francisco, preferred	6	49	50½
Western Union Telegraph of New York	extra	93½	92⅞
Industrials—			
Electric Storage of Philadelphia, common	4	48	49
General Electric of Schenectady	8	139½	140¾
Westinghouse Electric & Mfg. of Pittsburgh, common	+extra	40½	40
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	59

*Last sale.